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MAY/JUNE 1981

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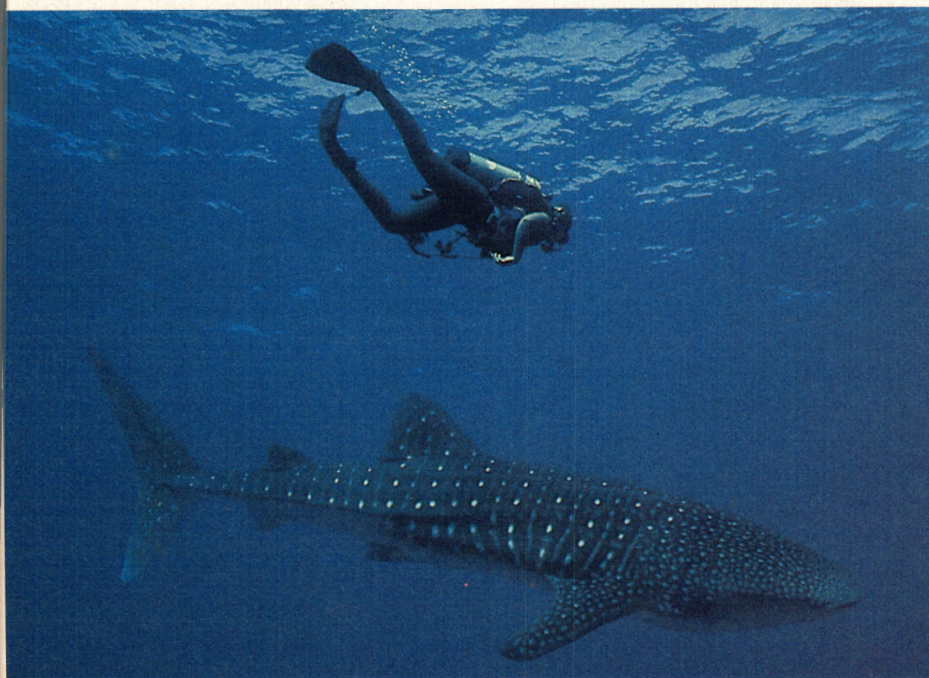
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Mix or match 'em. We present an array of gauges in combo or console that can be made to fit your order.

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To strobe underwater is a must. The question, then, is which strobe will fit the bill. Frink shines with this comparison test.

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He's affectionately known as "Papa Flash" to his friends and admirers. To the rest of the world he's the creative genius who's given us the strobe light and side-scan sonar.

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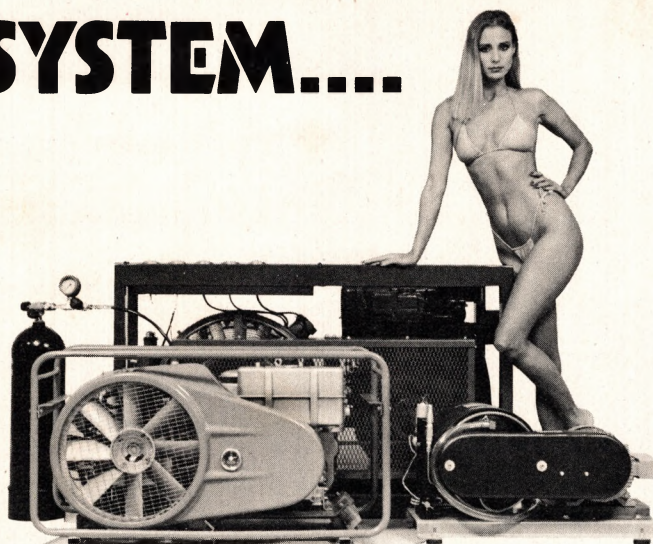
I Learned About Diving

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by Norman B. Hamilton

Cover: Snail's eye view of California kelp, *Macrocystis pyrifera*, by Bob Evans.

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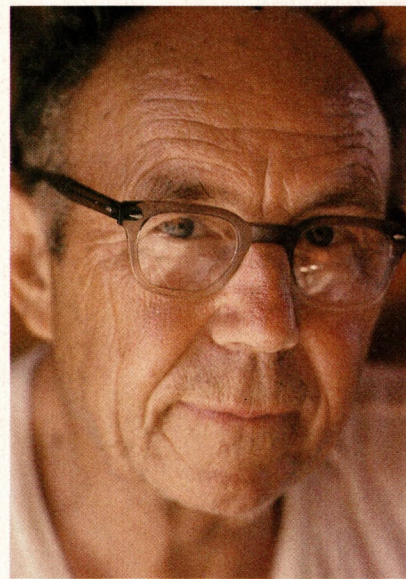
INSIDE SPORT DIVER

Papa Flash still has the spark.

IT'S ODD, BUT TRUE. It took an electrical engineer — not an oceanographer — to revolutionize our view of the ocean. The man is Dr. Harold Edgerton, or "Papa Flash" as his friends call him. In the 1930s, as a student at the Massachusetts Institute of Technology, Edgerton invented the synchronous strobe light, the all-pervasive flash of light that replaced flash-bulbs in camera bags and warns airplanes away from high buildings.

The strobe fundamentally changed the way we see, forced us to think in time-frames of 1/100,000th of a second — catching a bullet's gyrations in flight and the shattering of a light bulb as it finds its target. The strobe laid open the black depths of the ocean where a powerful, repeating light source was needed to make photographs. So did some of Edgerton's other inventions: deep-sea stereoscopic cameras, depth sounders, side-scan sonar.

When I first met Edgerton I was impressed by his intellect and charmed by his matter-of-fact approach to life. He looks and talks like someone's grandfather from Nebraska (which he is). He can tell a good joke and seems unaware of his world-class scientific stature. The man doesn't have time for posturing, he's too busy having fun. At the time we met, he was having fun with a new way to photograph plankton. They squiggle so under the microscope, he said, that it was hard to get a clear shot without an instrument the size of a Lincoln Continental. We were dragged into a back room where his Apparatus was set up. Edgerton hung a black box over the edge of a table, put a sheet of ordinary black and white film on the floor underneath, poured seawater on the film and pushed a button. Five minutes later we had a sharp, clear picture of a dozen dinoflagellates conducting business. Just like that. No flame-blue arcs of hissing electrons, no explosions, no smoke. The set-up fit in a suitcase two feet square. I got the



DAVID DOUBILET

impression that with a cigar box full of spare parts and a soldering iron he could solve the energy problem.

Author Phil Trupp reports (page 66) that, at 77, Edgerton's charm is still working miracles on journalists.

Some of Edgerton's "stepchildren" are reviewed in our photo section (page 52). Stephen Frink tested the top-of-the-line underwater strobes and found that, for the consumer, choices are broad and options many.

On a far different matter, this will be the last issue of *Sport Diver*. We find, due to circumstances in the diving industry, we are no longer able to produce a magazine of this quality at an affordable price. So, rather than degrade the product, Ziff-Davis Publishing Company has elected to cease publication.

The staff of *Sport Diver* would like to thank the hundreds of persons who made the magazine possible; who gave liberally of their time, talents and knowledge to help bring you a better magazine. And thank you, readers — you have been a loyal and appreciative audience.

Steve Blount

Steve Blount, Editor-in-Chief

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THE MAIL

Can All This Really be Happening?

Why must the increase in offshore oil development lead to abolishment of regulations? The abrogation of existing environmental controls can only be detrimental; any sacrifices, only a large step backward.

Unfortunately, as Mr. Trupp points out, our new Administration doesn't see it that way. So what else is new? It would be a foolhardy move to put our oceans in jeopardy and waste the efforts of scientists, researchers and environmentalists so a handful of industrial czars can turn a buck. I'm for "making America great again" but how great will we be if our oceans are dying?

Robert Glover
Northfield, NJ

A former dentist has control over the oceans? That should be an indication how seriously President Reagan regards the environment. Sure we need oil, but

not at the expense of the water, beaches and marine life. If those who care what happens to the oceans don't get vocal and organized, the only drilling Dentist Watt will be doing will be on ecologically sensitive areas off of California, leading to water and air pollution and potential disasters *a la* *Ixtoc 1*.

Helen Danaher
Mendocino, CA

While traveling through Washington, DC last week I heard a sad, but true, joke:

Q: *How much energy does it take to destroy the environment?*

A: *Just one (James) Watt.*

Ben Langford
El Paso, TX

James G. Watt is the man least likely to succeed in the job he's supposed to do—conserve the environment and use it with sound, reasoned judgement. A

known political hack, he is the perfect Reagan type: the corporate image who translates profit as progress. I agree with Jake and Harry. There is going to be a war and all the cuts in spending and all the talk of tax breaks is little more than gloss to cover an all-out assault, for profit, on our little piece of the planet.

Spencer Meilstrup
White Plains, NY

Novice Mouth-Breathers

I can empathize with Mike Knepper's ("The Near-Neophyte Diver," Jan/Feb 1981) thoughts and feelings during his initial scuba course. I felt the same "valleys and peaks." My instructor was supportive and not above a verbal "good stroke" for a task well done. She made a point of relaying the enjoyment, pleasure and fun of diving and not just the dangers.

I agree with Mike—instructors need to turn on those sensitivity meters. Even



That can't be Jack...

**I didn't even think
he knew how to swim!**

**Looks like he knows
more than we thought...**

a fish would be a bit scared out of the water the first time!

Aun Foretay
Aruba, NA

I don't think we instructors put ourselves in the shoes (or fins) of the student often enough. Are our memories so poor that we remember performing all our scuba skills perfectly in our first class?

John Shoemaker
Arnold, MD

One More Satisfied Customer

Thoroughly enjoyed your long overdue piece on Dave Woodward (Jan/Feb 1981). I was only certified four months when I first met Dave and I was quite nervous. As Mr. Trupp said, Dave has the ability to size up a person and he sensed my anxiety and gave me special attention. I gained a lot of confidence from him. He's a fantastic person and the best underwater guide/divemaster I've ever met.

I wish Dave and Guy the best and hope they get a new stereo.

Andrea Thomas
West Palm Beach, FL

Personal Foul in the Philippines

Tim Cahill might be interested in knowing fish aren't the only victims of dynamiting in the Philippines (Jan/Feb 1981). Three of us were diving out of Luzon in the South China Sea in 1979, enjoying a 40-foot reef. We were rocked by a muffled "whumph" and a pressure wave rolled us about.

Upon surfacing we joined a non-diving friend for lunch. She also heard the explosion and described a ten-meter plume of water less than 100 meters from our banca. Fishing boats immediately converged on the foaming water and dip-netted fish as they floated up.

I've always thought dynamiting fish was in poor taste, but blasting divers borders on unsportsmanlike conduct.

Glenn Wasson
Petaluma, CA

And Now From the ASPCA

I think putting a helpless animal in a diving suit and forcing it to risk its life is unconscionable, deplorable and probably illegal. The producers of "Benji" practice the most hideous sort of exploitation and I wonder who the "dogs" really are. Dogs don't have agents, only a sense of

loyalty beyond the obvious cruelty of vivisectionist show business personalities who think it's "keeeeyuute!"

Mrs. Noel F. Barrington
Pacific Palisades, CA

I recently picked up your magazine at a friend's house and happened upon "Benji Goes Diving." To say the story is keeeeyuute! is certainly an understatement. I have watched and loved the greatest dog heroes (and heroines, too)—from Lassie to White Fang to Underdog. Benji ranks among the top. Heck, Benji is tops.

I have just one question: How did owner/trainer Inn make Benji keep the regulator firmly clamped between his, er, her teeth? I have a bet with my boyfriend that Benji does it voluntarily while he says they just wire her jaw around it. Could you please clarify?

Penelope Keith
Satellite Beach, FL

Looks like a draw, Penny, as neither case is true. The Benji in the picture is not Benji. It's actually a mechanical dog used for the real hair-raising action. Besides, who ever heard of a dog scuba diving? —Ed. ☺

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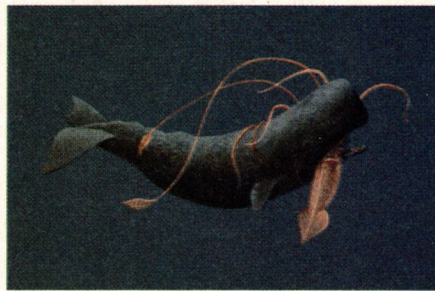
AN INTERESTING SIDELIGHT to sperm whale research is the irregular appearance of giant squid, both within sperm whales and in lore. Because the little knowledge we have about giant squids comes from dead or dying specimens—found in the stomach of captured sperm whales or occasionally floating on the surface—we rely on infrequent observations for information. We can only guess their maximum size: how are we to know that when sperm whales dine they don't eat only small giant squids? And details about giant squid behavior, speed, breeding, feeding or geographic distribution is almost nonexistent.

Cephalopods ("head-feet") belong to the phylum Mollusca, which includes snails, clams and oysters. All but one species are shell-less and, in contrast to their slow-moving relatives, are capable of rapid locomotion and are highly effective predators. They have a large and complex nervous system with an exceedingly well-developed brain. Perhaps the most startling similarity of cephalopods to vertebrates is their large, image-forming eyes, which work as ours do.

Squid, octopuses and the chambered nautilus are the most familiar members of the order Cephalopoda, which contains close to 1000 different species. Some of the smaller squids are familiar to us as they've been served and eaten at tables around the world. The common octopus, also recognized at dinner parties, bears the scientific name *Octopus vulgaris* or "common octopus." The plural of octopus is generally accepted to be octopuses. Those high-falutin' words like octopi, octopods or octopodes are better avoided unless you're trying to impress someone with your lack of knowledge.

The greatest distinguishing outward

physical characteristic of cephalopods are the varying numbers of appendages. Octopuses have eight arms, squids have ten, and nautiluses, the only cephalopods with an external shell, have between 60 and 90. The largest octopus is supposed to be the North Pacific species, which spans 20 feet from the tip of one outstretched tentacle to another. Giant squid, on the other hand—or tenta-



RICHARD ELLIS

cle—are considerably larger. They have in addition to the eight arms normally equipped octopuses boast, an extra pair of tentacles—much longer than the other eight—which have at the ends flattened discs that are usually armed with claws or suckers.

These creatures have been known to get rather large. A giant squid weighing more than 400 pounds was retrieved from a sperm whale taken in the Azores. Its length was 34 and a half feet. North of the Bahamas, a 47-foot specimen, was found alive but dying. Other known specimens have been measured at more than 50 feet and there are some, usually found in poor condition, whose length has been estimated at better than 60 feet. Since few records of living giant squid exist, we depend on reports handed down over the centuries, or repeated as elements of sea-going folklore.

Squids of more than 60 feet have been considered the ultimate sea-monsters—even more than giant sharks. These creatures have the power to send shivers down the spine of even the bravest mariner. In Medieval times the "kraken" was reputed to wrap its immense arms around the masts of sailing ships, drag-

ging them to the bottom with all hands aboard. Numerous "eye-witness" reports have squids attacking ships while an often-repeated story of two fishermen in a dory off Newfoundland in 1873 who approached what was thought to be "wreckage on the surface," found it a giant squid that latched its tentacles around their boat. Hacking at its tentacles with an axe, they drove off the wounded animal, but not before it left behind a 19-foot section of one of its arms.

These fabled many-armed monsters of the deep were thought to have been squid—of known or unknown varieties. The better-known octopuses have been considered a smaller and more amiable cousin of the ten-armed creatures. But a single account, documented by photographs and microscopic tissue examinations, may prove giant octopuses to be the largest cephalopod ever known.

The research concerns an animal washed up on the beach at St. Augustine, Florida in 1897. According to the examination of the remains, it was calculated the living creature had a girth of 25 feet and tentacles 72 feet long. The tissue, stored in Formalin at the Smithsonian for more than 60 years, was studied and found to be from neither squid nor whale. It is guessed to be from a gigantic octopus, with arms 75 to 100 feet in length and about 18 inches in diameter at the base—a total of nearly 200 feet.

It is difficult to explain away scientific evidence just because it doesn't agree with preconceptions. In light of evidence, it would appear there are gigantic cephalopods in the ocean's depths and those who are appalled by the thought of a small octopus would be well-advised not to think of these monsters. They are no longer just products of Walt Disney Studios; they've been proved to be real and, once again, lie under the protective oceans. In the unfathomable blackness of the abyss, science has proven there are creatures that strain the limits of the most vivid imagination. ☞

Richard Ellis is a writer and illustrator whose world is natural history. His latest work, *The Book of Whales*, was released by Alfred A. Knopf in December 1980.

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TIM CAHILL

Tales of Deception.

NEARLY AS SOON as I got to Seattle, I began to hear tales of Deception.

"My wife and I dived it once," a diver says, his voice twangs with pride and awe at his own feat. "It must have been one of the strangest days on record. Only a six-inch tide change."

"Impossible," a second diver flatly disagrees.

"No, really. It was almost *smooth*," the gutsy diver confides. "My wife thinks we ought to have little patches made up for our drysuits: 'We dived Deception Pass'."

The pass is a narrow corridor of rock that lies between Skagit Bay and Rosario Straits. It's about 70 miles north of Seattle, near the town of Anacortes. To visualize it, imagine San Francisco's Golden Gate Bridge — and all its surrounding rushing water — scrunched down to about a quarter of a mile. Now you begin to get a picture of Deception Pass. Out in the middle of all that turbulent green water — a bit more to the north than the south — is a long, rocky island that breaks up the current and forms one of the pillars of a high, arching bridge. Certain pilots (now deceased) have dared to maneuver small planes through the arches of that bridge, or so some divers say. It's the likes of Deception Pass that challenge humans and force them to act in odd and reckless ways.

I drove to the pass one misty late-winter afternoon. The road wound down through a dark forest of massive firs, and fog hovered, Zen-like and contemplative in the hollows and river bottoms. It's a damp and proper forest; a good place to compose ominous symphonies, or meditate upon the Godhead or contemplate life-changing decisions. The pass itself is, if possible, even more

inspiring, more spiritually rewarding, and its diving is suicidal.

The water rips and roars and tumbles beneath the bridge and is close to the color of the forest. As the tide goes out, moving from Skagit Bay into Rosario Straits, one tongue of current runs between the island and the north wall. It moves with the character and speed of a whitewater river. Another river of cur-



JOHN LAKEY

rent runs along the south side of the island. Between these two torrents, and on either side, are fully formed whirlpools.

I stopped counting these little hurricanes after I reached 100. A yachtsman told me one of those whirlpools once grabbed his 55,000-pound twin-diesel cruiser and spun it 180 degrees.

"I've seen 50- and 60-foot boom logs sucked under," says a local diver. "They stay under for a long time and finally come up about a quarter of a mile down current."

"At low tide," he says, "the water comes out of Skagit Bay and brings all the silt and debris from the mudflats and from the Skagit River." He pauses, thinking of that tumult and adds, "you have almost no visibility after low tide."

The trick, he continues, is to plan your dive for the slack just after high tide when the water is clearest. Sometimes, despite what it says in the tides and currents manuals, there is no slack tide. "Other times," he says, "it smooths out real good, and there's very little current — and no whirlpools." These ideal conditions happen a few times a year.

"What's down there?" I ask.

"Bowling balls, hubcaps," he answers with measured disgust. "People toss stuff off the bridge." In addition to the debris discarded by these cretins there are rocky ledges, holes thought to be 300 feet deep, giant anemones, and "some hellacious big fish," protected by a recent law banning spearfishing.

"You'll be diving," he says, "and the water will be full of fish. All of a sudden they disappear into the cracks and crevices in the wall. They seem to know it's coming and they can't swim against it." His face changes from one touched with natural fear to a calm, calculated look. "I remember this happened once and I surfaced. I could see it about a quarter of a mile away, coming for us. It looked like a huge roller coaster of water racing directly toward the pass."

"Mostly," he admits, "it's the thrill. There's a lot of adrenalin generated by that water, and when you get out, you can say you dived Deception Pass."

"How did it get its name," I asked.

"I don't know."

It was, emphatically, not one of those few times a year when diving the pass would be possible. But I had an idea. Clambering quickly down the steep slope, I reached the rocky headland and leapt aboard a passing log — like a movie cowboy mounting a horse from a saloon balcony. Fully clothed I rode that log into the current. Cowardice had no dominion over me. A great pool of spinning water grabbed the log. I pulled a deep breath and rode it down, descending 150 feet in less than 30 seconds. It was like riding an enraged Brahma bull and, I confess, I wasted a good deal of precious air laughing for sheer joy. Suddenly, the huge log rose, bulletlike, toward the surface. I held tight and it came shooting 20 feet out of the water, like a leaping dolphin, with me whooping on its back. Bystanders cheered themselves hoarse and I made the front page of papers all over the Pacific Northwest.

And that is why it's called Deception Pass.

Back from South American jungle jumping, Tim Cahill admits he's seen few heartier divers than those who practice their insanity along Washington's Olympic Peninsula. "And sometimes," he says with wide eyes, "they even dive in the water."



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JEAN-MICHEL COUSTEAU

Give us a home where we all may roam.

NEAR THE POINT WHERE Quebec's Saguenay River empties its cocoa-colored waters into the St. Lawrence River, a small herd of white (or beluga) whales is regularly sighted by the myriad ships plying this busy seaway between the Atlantic and the Great Lakes. All year the belugas remain within a 500-mile stretch of the St. Lawrence, taking advantage of a tongue of copepod-bearing Arctic water that streams through the depths of the Gulf of St. Lawrence and upwells in the river. The upwelling keeps this region free of ice in the winter and attracts an abundant population of smeltlike capelin. The capelin, in turn, attract the belugas, as well as some seasonal tourists from the Atlantic—blue, fin, sei, minke, humpback and pilot whales.

As *Calypso* passed the belugas' home waters last summer and again this past winter, we were able to count about 200 of the gleaming white whales; Canadian scientists estimate there are between 300 to 500 in all. They are, like all cetaceans, intelligent animals and their sonar chirps—resonated and focused through the bulging "melon" of their foreheads—are so raucous early whalers called the white whales "sea canaries." But unlike many other cetaceans, St. Lawrence belugas are not easily approached in the wild by divers. Followed by a Zodiac, they flee. Their underwater "screams" beam in every direction. Their wariness is not without cause. The St. Lawrence white whale herd once numbered about 5000. The belugas were hunted relentlessly for oil, meat and leather. Early Basque whalers began the industry; it declined as herds thinned and ended with the Canadian ban on whale hunting in 1973.

In similar cases wild herds such as Pacific grays and sea otters, respond

well and propagate under reasonably effective protection. But the St. Lawrence beluga herds decline by 25 each year.

The decline of the belugas is not wholly understood, but it seems a combination of factors are to blame. Among the several belugas stranded on the St. Lawrence's banks each year, some have bullet wounds, others wear propeller slashes. A hydroelectric dam has altered con-

*Among the belugas
stranded along the river,
some have bullet
wounds while others wear
propeller slashes.*

ditions in the Manicouagan River, once a favorite summer beluga calving site. But there may be a more egregious contributing factor, as Dr. Jean Boulva of the Department of Fisheries and Oceans of Canada told me. Dr. Boulva is interested in the effects of polychlorinated biphenyls on belugas in the St. Lawrence. He points out that PCB concentrations of 200 parts per million have been associated with declining fecundity among ring seals in the Baltic Sea. In the Saguenay area, researchers have found belugas with PCB concentrations as high as 800 ppm. Those of us aboard *Calypso* wonder if these findings may be related to a distant problem in Waukegan Harbor on Lake Michigan. There, a single manufacturer became one of the Great Lakes' severest polluters by allowing nearly a million pounds of PCB—which remains hazardous for decades and has been shown to cause birth defects and cancer—to leak into Lake Michigan. The discharges were halted by the Environmental Protection Agency in 1978, but some bottom sediments in Waukegan Harbor still contain PCB "hot spots" where concentrations reach 200,000 ppm. This source and others have made

St. Lawrence drainage the most PCB-polluted waters in North America.

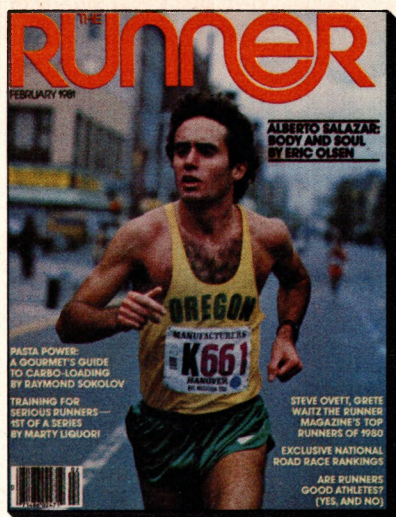
Like the disposal of toxic materials on land, the flushing of chemical wastes into rivers, lakes and oceans does not end the matter; the poisons work their way back into our lives eventually. Decision makers do not seem to comprehend this unavoidable reality of nature.

The Cousteau Society believes preventative medicine for the planet is superior to artificial, after-the-fact remedies of clean-up and treatment. The real answer to chemical pollution lies in careful testing and regulation before a new substance enters production, enters waste disposal channels, enters fish—enters our bellies. That is an expensive cure. But perhaps no more expensive than the visible medical costs borne by contaminated victims and the invisible costs of human suffering and the quiet decay of natural systems and species—like the irreplaceable white whales of the St. Lawrence.

If the decline of the gentle belugas we encountered is linked definitely to PCB streaming from remote sources in the Great Lakes, it will underscore at least two sad aspects of abuse of the water system. First, it is a universal denigration since water travels incessantly, distributing poisons across boundaries, throughout the vaporous atmosphere and the cold liquid depths, into the cells of all living organisms. The effects are unpredictable, the destructive agents irretrievable.

The second, and perhaps most poignant, aspect is that the insidious, long-lasting effects of chemicals like PCB can undo our efforts to rescue the sea. Eight years ago Canada decided to protect whales, including the St. Lawrence belugas. Now a distant insult to a different body of water may cancel out the progress. Permanent, invisible garbage created by the hand of the human chemist could deal a fatal blow to marine species we have finally decided to save from the hand of the human hunter. ☺

Jean-Michel Cousteau, son of undersea pioneer Jacques, is executive vice president of the non-profit environmental organization, The Cousteau Society. For information, write: 930 West 21 Street, Norfolk, VA 23517.



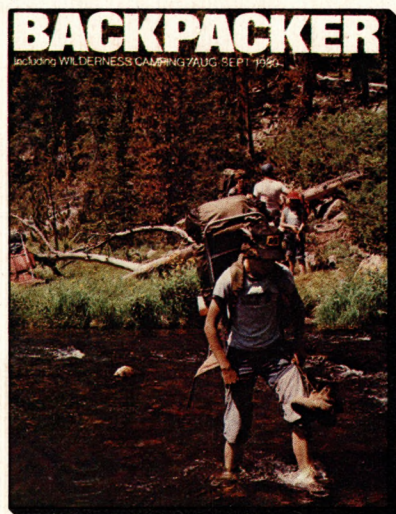
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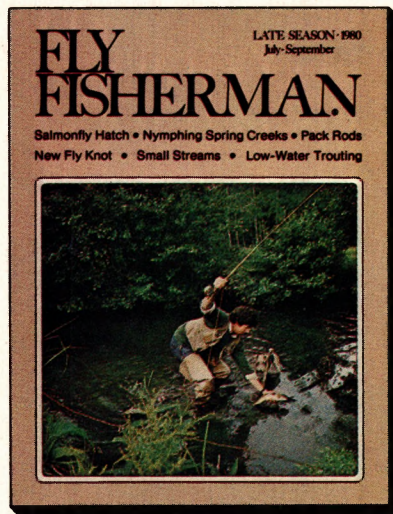
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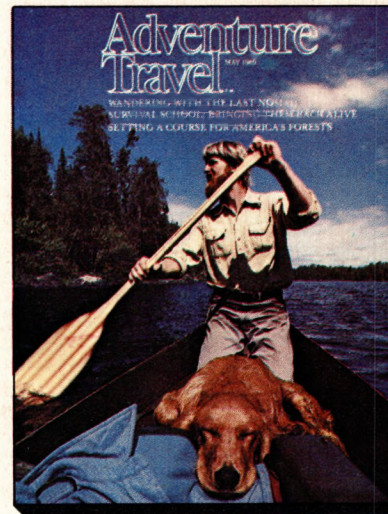
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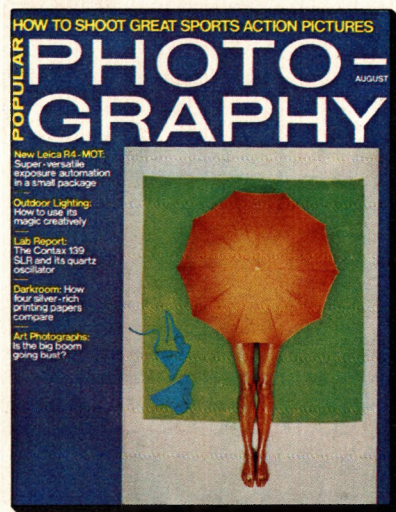
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LETTER FROM WASHINGTON

Big-Business: One Watt; Environment: Zero

BY PHIL TRUPP

PRESIDENT RONALD REAGAN made himself and Borax a household word. Now he and Joseph Coors, the man who gave us Colorado Kool-Aid, the brew of the West, bring to you, the concerned citizen/diver, a brand new Enviro-Czar and protector of the planet, Mr. James G. Watt, Secretary of the Interior.

Coors backs him and Reagan sees in him a true soulmate.

"I'm an environmentalist and so is Jim Watt," says the President.

And of course Mr. Coors, who as you read this builds a brewery in a teetotaling Mennonite section of the Shenandoah Valley, knows a man of the people when he sees one.

So why is Mr. Watt — a tall, wiry 42-year-old born-again Christian — so unpopular with environmentalists?

Maybe it's because of quotes like this: "Nuclear power is as safe as most other events in life."

Indeed it went over very well three years ago in his speech before the Atomic Industrial Forum, but visions of glowing offshore atomic reactors flashed in the eyes of no-nukers.

Or maybe it's because Mr. Watt told the *Denver Post*: "Environmentalists are the greatest threat to the ecology of the West."

Perhaps his popularity is due in part to the job he held as chief legal counsel to the Mountain States Legal Foundation. That foundation, a non-profit law firm with a budget of more than \$1 million, is supposed to represent the public interest on environmental issues. It does represent an interest, but its public are megabuck operations such as Exxon, Mobil Oil and Boise-Cascade. The environmentalists just don't believe what's good for business is also *always* good for

the public interest. And it became an issue when Mr. Watt refused to reveal the list of Mountain States' contributors to the Senate during his confirmation hearings. He said he needed approval from the board of directors.

Mr. Watt came to Washington in the early 60s as a congressional aide, and between 1966 and 1969 served as a lobbyist for the U.S. Chamber of Commerce. He

*Does the
"Sagebrush Rebellion"
wind its way to
the oceans? Mr. Watt
won't say.*

worked, some say, almost "fanatically" against enactment of clean air and water laws — laws the Reaganites fully intend to "liberalize" in the next four years.

His bias was apparent later when as a member of the Federal Power Commission, he voted 71 of 74 times for higher rates for consumers. And when former Interior Secretary Russell Train asked Mr. Watt to come to work for him, Train had to secretly promise Senators Edmund Muskie, William Proxmire and Henry Jackson that he wouldn't be placed in a policymaking position.

In July 1972, as director of the Bureau of Outdoor Recreation (under the Department of Interior), he promptly engendered a sort of vague scandal: It was alleged Mr. Watt was awarding construction contracts to old school chums in his home state of Wyoming. Nothing much ever came of it, but it didn't settle well with the environmentalists.

During his confirmation hearings earlier this year he was asked about his position on placing clean-up equipment at offshore oil drilling rigs on the Georges Bank. It wasn't that Mr. Watt wouldn't be pinned down, he just wasn't sure what equipment was needed or who

should pay for it. He'd study the issue, he said. But few doubt who will get the bill for future slicks.

On other offshore issues, he was just as vague; not an encouraging show for the man who will decide the use of federal waters.

Peter Lafen, spokesman for Friends of the Earth, an environmental group with about 25,000 members, has serious doubts about Mr. Watt.

"His pro-industry positions are clear," Lafen says. "Why should he change now?" And, Lafen adds, because he'll oversee cases brought before the federal government by his former employer, Mountain States, "he'll face serious conflicts of interest."

But President Reagan defends Mr. Watt. He says he can "grow" in the job. But the feeling from Lafen is Watt may grow to be an ogre. He may have a good start on the image as an advocate of the "Sagebrush Rebellion" taking place in the West, a rebellion that seeks an end to what some Westerners believe is excessive regulation of federal lands. Does the sagebrush wind its way to the oceans? Mr. Watt won't say.

Lafen says when it comes to a trade-off between the environment and commercial development, Mr. Watt is likely to go for the latter. Others say his appointment as Interior Secretary reveals President Reagan's belief that the defeat of the liberals in 1980 allows a corresponding defeat for environmentalists; that President Reagan misread his mandate.

"It's really the first shot at the environmental community," say Mike Weber, marine habitat coordinator for the Center for Environmental Education. Weber says that shot is vibrating with buzz-phrases like "balanced development." It's a way of turning the language upside down.

"Balanced development means different things to different people," Weber says. He calls it a smoke screen calibrated on a high-fog index, it's "a kind of

Phil Trupp is Sport Diver's Washington connection. An experienced author and diver, Phil has spent 20 years covering the Washington scene for major publications.

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WASHINGTON *continued*

subversive rhetoric."

Those are demanding words by Weber, but apparently they are on target. For instance, Mountain States officials have filed more than 40 suits against the Department of Interior. In defense of one of those suits Mr. Watt argued public utility companies in Colorado aren't "social welfare agencies" and therefore shouldn't give rate breaks to elderly, poor or handicapped persons. In another case he reasoned the Bureau of Land Management had no right to restrict grazing in over-grazed areas of New Mexico.

More recently Mr. Watt linked himself to a report by the Heritage Foundation, a right-wing think tank that has sidled up to the Reaganites. The report recommends the government lease offshore oil drilling sites "on demand" — experimentally — with little or no priority given to ecological impact. The environmentalists say Mr. Watt should recognize that leasing on demand is a prescription for disaster.

And they feel strongly that the DOI should involve the public to a much greater extent in the offshore leasing controversy; there has to be participation and education at the state and local levels.

"Republicans are good at local politics," Weber says. Mr. Watt ought to pursue this approach.

Watt also has to resist attempts to amend the Outer Continental Shelf Lands Act, which is aimed at speeding commercial exploitation of coastal waters. Inshore waters suffer many pressures and uses and they aren't there simply for profit taking.

Coastal waters are really public waters, Weber insists, and we need to know more about them. "Marine sanctuaries are the key," he says.

What Mr. Watt should or shouldn't do is a matter of much debate. But it's all a game of money and power. In the end the major environmental groups will have to toughen their positions: No more Mr. Nice Guy. It's time to be realistic and — heaven forbid — political. This means fewer Save the World posters and more direct clout.

Maybe it's time Mr. Watt — and even the powerful Mr. Coors — face a great white shark instead of a docile, liberal-leaning morality. Bite first, ask questions later may not fit the official size and weight image of the concerned ecologist. But it lets the opposition know that waging war against the planet will indeed be hell.



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CAYMAN ISLANDS

One of the last British Crown colonies in the Caribbean is blessed with accommodating winds, unequalled diversity and world-class diving.

BY DAVID ABRAHAMSON



PAUL HUMANN

Bursts of underwater color off Grand Cayman range from the coming-going decoration of a fairy basslet, above, to the fathoms of yet-to-be-explored walls, right.

His Excellency The Governor of the Cayman Islands, Mr. Thomas Russell, Companion of the Order of St. Michael and St. George and Commander of the Order of the British Empire, assumed his post as chief of state of one of the last British colonies in the Caribbean in 1974. Unfortunately, His Excellency is not a diver. At some point during his more than 30 years of "colonial service," much of it spent in the Western Pacific, he suffered a punctured eardrum. As result, one of his colony's principal attractions — world-class diving—is beyond his reach.

Ever a diplomat, however, the governor does not seem outwardly troubled by his misfortune. Sitting on a sofa in his comfortable fourth-floor corner office in

David Abrahamson is Sport Diver's editor-at-large.

George Town's Glass House government building, he is alert but relaxed. A portrait of Queen Elizabeth smiles down from a far wall, and a carved wooden crocodile, a memento of his service in the Solomon Islands, grins up from the coffee table at his feet.

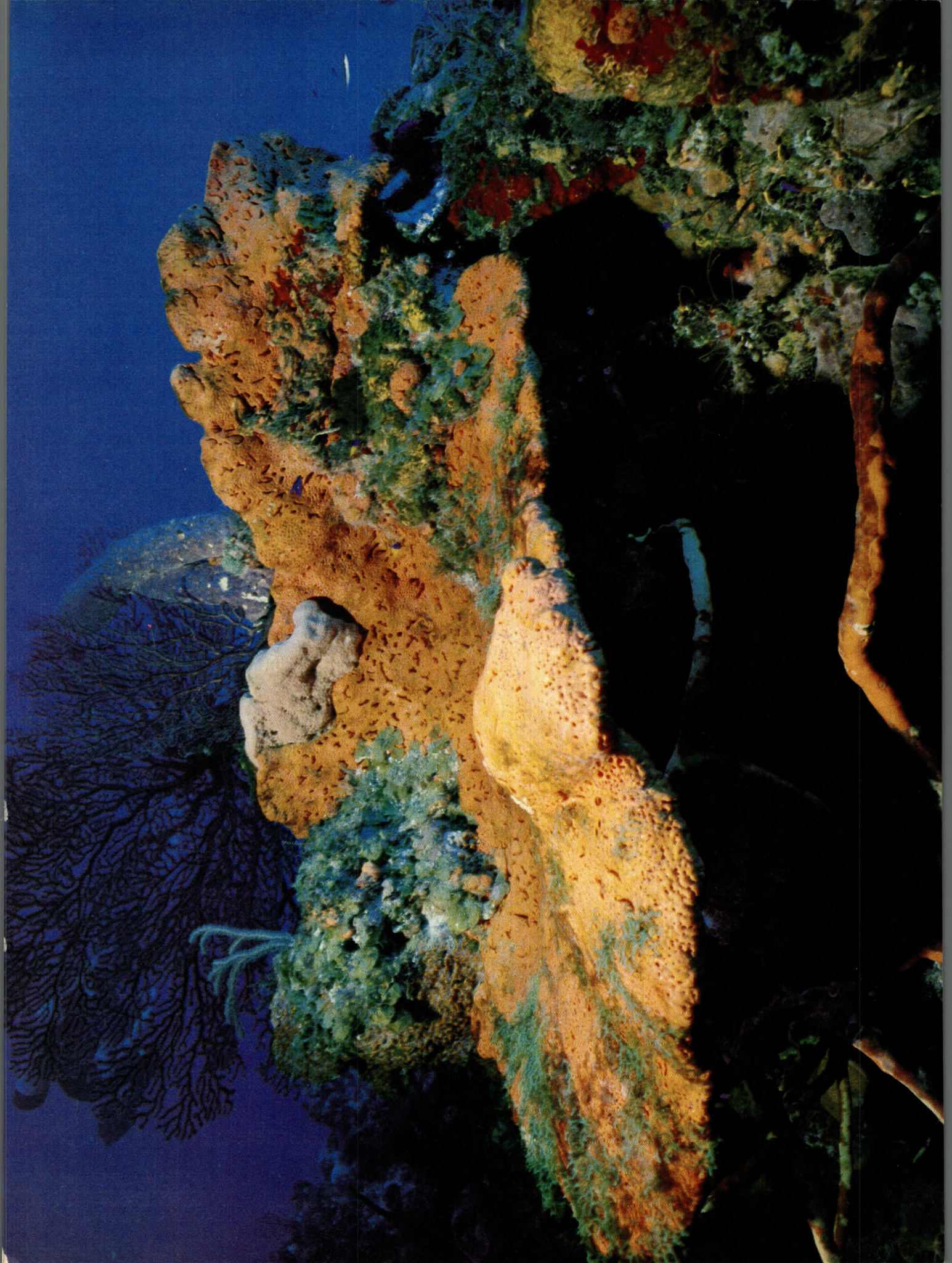
A man of precision and rectitude befitting his Scots forbears, His Excellency chooses his words with practiced care. But his sense of humor is both direct and disarming. When asked what might be in store for him if reassigned to London at the end of his three-year appointment, he smiles quickly and answers: "an ulcer."

One matter the governor does not have many worries about is Caymans' thriving diving business. According to government estimates tourism as a whole represents a quarter of the colony's gross national product, and approximately a third of the 120,000 tourists who passed through airport customs in 1980 were divers. "Our diving industry," says the governor in a matter-of-fact tone, "does have a reputation for superb management."

The two other major elements in the islands' economy are "offshore" finance and condominium construction. Less than 30 years ago the islands could not claim a single bank, and as recently as 1966 there were only three. Today there are more than 300—one bank for every 55 of the colony's 16,677 inhabitants. Only ten percent of the banks, however, are licensed to conduct local business. The rest are restricted to "carrying on banking and trust business anywhere in the world except the Cayman Islands," and a look at a list of holders of offshore banking licenses reads like a Who's Who of international finance. To a creative banker, the colony's favorable tax laws and lenient financial reporting requirements make Cayman the best thing to happen to banking since the invention of Switzerland. In fact, in some aspects of financial confidentiality, George Town is said to surpass Geneva.

The construction boom began in earnest only recently, and is still largely confined to the western shore of the main island of Grand Cayman. In 1978 building permits were issued for properties valued at \$14 million; a year later the figure had skyrocketed to \$78 million. Today both land prices and the number of construction sites are increasing at a noticeably non-tropical rate. All along Seven-Mile Beach immediately north of George Town, most of the available

DAVE WOODWARD



beachfront property is either developed or under construction.

All of which is to say the Cayman Islands are a going concern, turning a tidy profit, thank you. The per capita GNP of the colony is close to \$4000, the highest in the Caribbean and ten times the level typically used by the United Nations to define poverty. The prevailing outlook of most Caymanians seems to be "business as usual," and they take pride in their accommodating adaptability. There are more jobs than workers. Since emancipation of the slaves in 1835, racial intermarriage has produced a population estimated to be 20 percent black, 20

off Seven-Mile Beach and George Town — with the more popular dive sites—is almost always flat calm. On the occasional day when a nor'wester ruffles the West Bay, it is only a few minutes by boat down and around the South West Point of the island to the then-protected waters of the South Sound. So the chance of being completely weathered out of diving is restricted to only a handful of days a year—typically in the early-fall hurricane season.

The well-deserved principal attraction of Cayman diving is the fabled wall, a dropoff that surrounds Grand Cayman's entire 22-mile length and eight-mile breadth only a few hundred yards off the beach. In most locations its upper rim starts at 50 to 80 feet and then descends almost vertically thousands of feet into the cobalt abyss. In many places sand gullies, spires, crevasses, tunnels and caves intersect the face of the wall, creating such popular West Bay dive locations as Orange Canyon, Big Tunnel and Trinity Caves.

Typical protocol of most West Bay dive operators calls for a deep dive — usually to a 100-foot limit for safety reasons — first thing in the morning, followed by a shallower second-tank dive before lunch and an optional shallow dive in the afternoon.

But even for the most rabid "deep freaks" — a species of sport diver well known to Cayman's divemasters—shallow does not mean uninteresting. The remains of the 375-foot steel wreck *Balboa* lie in only 40 feet of water in the middle of George Town Harbor. Dynamited apart long ago as a hazard to navigation, the resulting jumble of decking litter and plating serves as a refuge for a wide variety of sea life, including at least four octopuses that have grown accustomed to performing almost every evening for night divers.

Even more dramatic is the wreck of the *Oro Verde*, a still-gleaming-white freighter intentionally sunk as a diving attraction. Resting comfortably almost on its keel in only 60 feet of water just off Seven-Mile Beach, the intact hulk has already become home to a generous share of interesting creatures. Most of the hatches and doors were removed from the ship before sinking, so numerous companionways and interior cabins are safely accessible, especially in the aft portion of the wreck.

The coral reefs surrounding Grand Cayman like a jeweled necklace are breathtaking in their beauty and diversi-



STEVE SMALL

Hermits, above, are finicky reef inhabitants. Never quite satisfied with the status quo, they will inspect and test-fit any empty shell they come upon. A floral arrangement, right, of anemone, sponges and coral greets many a Cayman diver.

percent white and 60 percent mixed. Most prominent family names such as Bodden and Ebanks have members representing every shade of color. Perhaps as a result, the islands have no history of overt racial strife. When asked in 1977 by a U.N. de-colonization mission if they wanted full independence, Caymanians firmly replied they preferred the stability of their status as a British Crown Colony. For its part, London has been glad to oblige its loyal subjects; except for a \$200,000 annual subsidy from Britain earmarked for top administrative and judicial salaries, the Caymans are entirely self-supporting.

Grand Cayman's success as a dive destination flows in large part from its natural blessings. The prevailing winds in winter arrive from the northeast and north; in summer, from the southeast. As a result, the island's western shore



ty. At an average depth of 40 to 50 feet, the coral formations are usually covered with staghorn above and interlaced with a network of interlocking caves and passageways below. Two popular shallow reef dive sites just south of George Town are Eden Rocks and Devil's Grotto; both offer a pleasant afternoon of simply snorkeling, if that's your preference.

Also south of the capital city is Waldo's Reef, named after a somewhat domesticated moray which delighted divers for a number of seasons. Unfortunately, the attentions of humans became too much for Waldo to bear last spring, and so, after reportedly nipping several

the most convenient. You can be picked up right on the beach in front of your hotel and be diving in 15 minutes. But because of the popularity of the West Bay there are fewer large fish and more anchor damage.

The south shore of Grand Cayman is generally acknowledged to have the most spectacular corals. The higher oxygen content in the water on the "sunnier" side of the island is perfect for elkhorns, which flourish there.

The wall surrounding the east end of the island is even more vertical than West Bay's. And perhaps because the area is host to fewer divers, the quantity of the wildlife seems greater. Another factor might be that the deep oceanic currents of the Caribbean arrive at Grand Cayman from the southeast, bringing with them abundant food.

The North Wall is the least visited area of all, and as a result it may offer the best opportunity for viewing undisturbed wildlife. Though the north coast does not have the variety of corals found on the island's other shores, it is the best habitat for Cayman's famous basket sponges, some of which are large enough to easily swallow the family stationwagon.

Each of the above areas, of course, has its advocates. And you can get into endless arguments about which is a more thrilling dive: Sentinel Rock in West Bay or the Maze off East End? Pinnacle Rock in the South Sound or Neptune's Gallery on the North Wall? The point to keep in mind, however, is that your choice is not between good and bad. Simply put, Grand Cayman does not have any bad diving. Whatever you're looking for as a diver, it is more than likely Cayman can deliver it — in spades.

The same comment about diversity fits the dive operators on Grand Cayman. At last count there were more than a dozen, and His Excellency The Governor's statement about "superb management" is well borne out.

It is somehow fitting that the diving in Grand Cayman is so extraordinary, because most American tourists (who account for three-quarters of all visitors) will find the island's shoreside diversions somewhat tame. There is no gambling, and recreational drugs other than alcohol are a decided no-no. Aside from the condominium construction and the less visible intensity of the island's financial enterprises, Grand Cayman remains a sleepy place. With annual work permits to non-Caymanians strictly ra-

ungracious hominid intruders, he disappeared last May. The good news of late January 1981 was Waldo had returned to his reef — with a mate. The fervent hope of the locals is that Waldo will now be treated with the sort of respect he richly deserves and not once again be driven off by too much attention.

Because so much of the diving in Grand Cayman is so good, choosing a particular dive site is not an easy task. Currents are rarely a factor, and depending on the weather pattern, visibility is usually better than 100 feet. For most people, it is simply a matter of selecting a location in the island's lee of the prevailing winds.

There are, however, generic differences in Grand Cayman's dive areas:

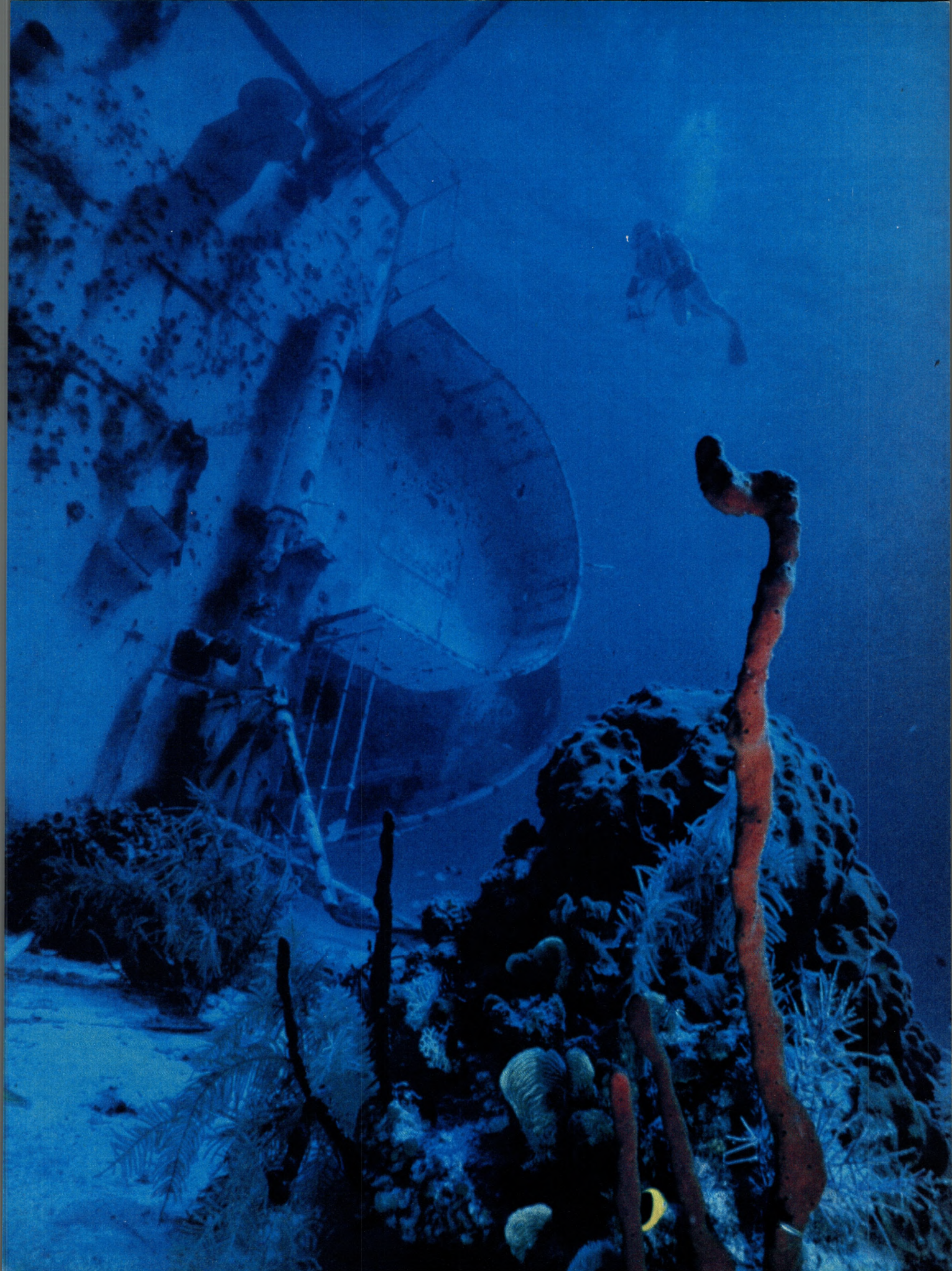
The West Bay sites — including those south of George Town — have to be ranked as the most weatherproof and



Above: A turtle hatchling from one of the self-replenishing farms of Grand Cayman. Right: Dive operators joined forces and sank the 184-foot freighter, Oro Verde in May 1980 off Seven Mile Beach.

NANCY SEFTON © 81

NANCY SEFTON © 81



tioned (less than 1600 issued last year), the colony seems in little danger of being overrun by the influence of its "expatriate"—as in "expatriate"—community.

True enough, there is a disco open six nights a week at the Holiday Inn, presided over by George Nowak (a.k.a. The Barefoot Man) and his group of calypso-rockers. And Saturday afternoons you can usually find a bit of like-thinking company at the band-and-brew get-together at Pedro's Castle on the south shore road. And the Club Inferno, located on the outskirts of the small village of Hell in West Bay, has been known to get exciting enough on a Saturday night to

Ports of Call, all on North Church Street on the way out of George Town.

Unlike a few other islands in the Caribbean, Cayman has an authentic native cuisine you'll want to sample. It comes in generous portions and is vigorously spiced. Don't miss either the Ranch House (upstairs from the Wreck of the John B. bar) or Welly's Cool Spot. Ask anyone for directions to either, and at least taste the curry chicken or "ackee [a relative of breadfruit] and cod" main courses. You won't regret it.

And whatever else you do shoreside, if you rent a car, remember to drive on the left—always. It is said the only thing the Caymanian people do fast is drive. Rusty roadside wrecks dot every couple of miles of the island's highways, interspersed with lonesome little circular signs reading "Accident Black Spot." They mark the location where someone met an untimely end. Don't be a Black Spot; drive left, slow and very cautiously. Your dive (and drive) buddy will appreciate it.

Trying to fathom the future of diving in Grand Cayman is a little like watching a beautiful sunset from the George Town pier: The clouds on the horizon look so far away, it is hard to believe they might mean nor'wester is on the way. Given the ever-increasing popularity of the island as a diving destination, however, the operators know they must look to the future.

"Our number-one priority has to be conservation," says one dive operator. "Sooner or later we're going to have to put in permanent moorings at the more popular West Bay sites to stop the damage from anchors."

Even more emphatically, he continues: "And we're all going to have to continue to rigorously enforce the game laws." At present, Caymanian law prohibits spearfishing with scuba tanks, but there is also an effort in the works to declare much of the West Bay an underwater park, affording it even greater legal protection. For the moment, however, the park designation is on hold, and the dive operators would very much like to see it followed through to enactment. But faced with its own problems of education, housing and social service, the government seems to have more pressing immediate concerns. And as the Governor said, Cayman's diving industry has so far proved it can manage well.

Not that the island leadership is blind to the future. When asked if an even greater influx of tourists — divers and



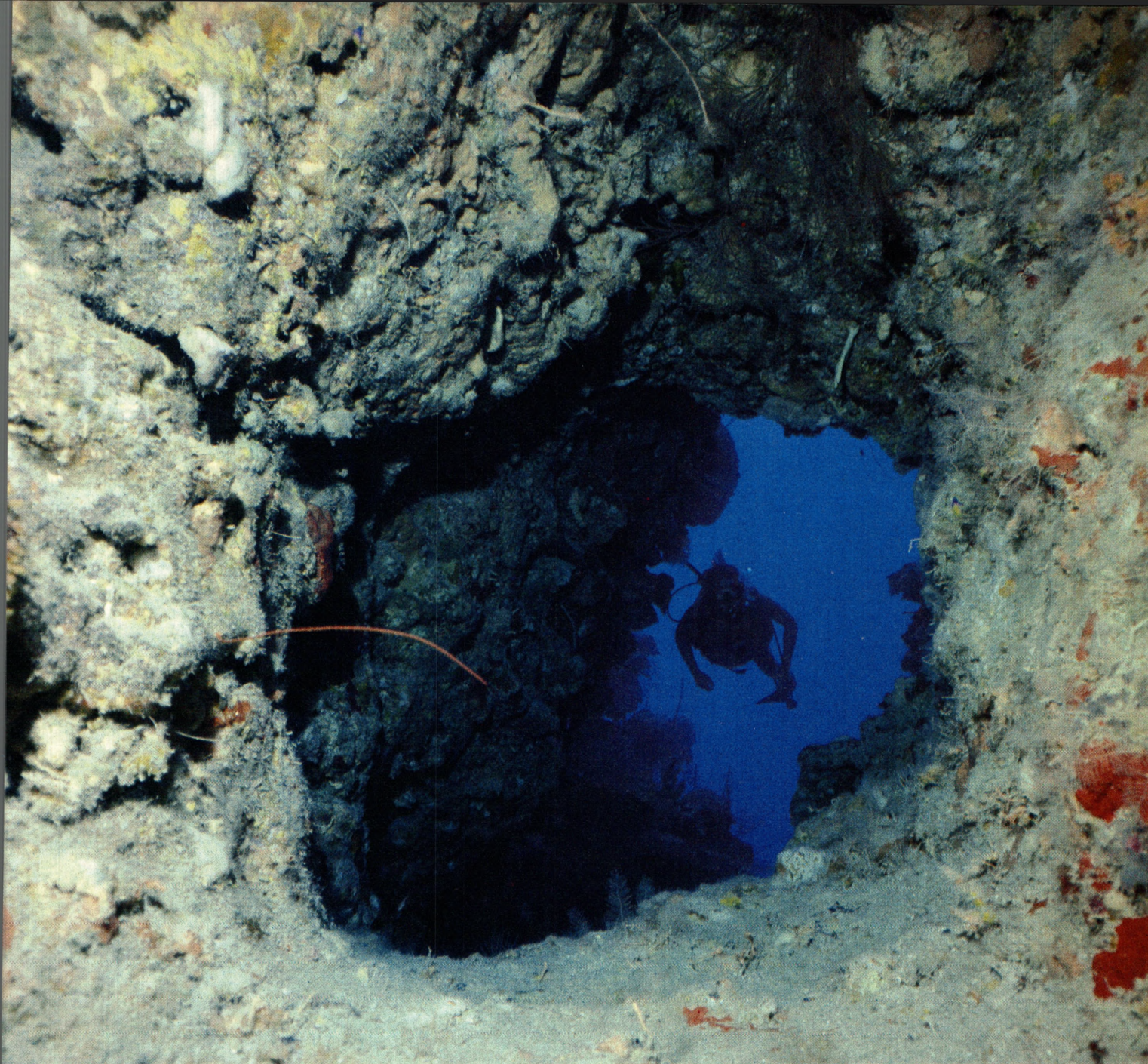
NANCY SEFTON © 81

The nocturnal predator, spotted moray, above, and the leggy crustacean, the arrow crab, hang out on a reef ledge. Right: Sometimes only six feet separates the limestone crevices of Trinity Caves near West Bay.

attract a visit from the local gendarmierie. But by late-20th-century standards, it is all surprisingly benign. And with each U.S. dollar worth only 80 cents C.I. or "see-eye," (Cayman Islands), it is fairly difficult to buy your way into any real trouble.

If you insist on spending money there are numerous duty-free shops in George Town, and they'd be delighted to sell you jewelry, bric-a-brac or the very latest in Japanese microcircuit wizardry.

There are a number of good restaurants in the capital. The Grand Old House on South Church Street has the best reputation, but it also has a sign over the door that reads, "Casual Attire Accepted, Casual Elegance Expected," so don't try to get in wearing shorts, Bermudas or otherwise. Slightly less old-school British but just as good are the Lobster Pot, the Almond Tree and the



BONNIE CHARLES

non-divers alike—could pose a threat to the historically stable culture of the islands, His Excellency paused before answering: “That will depend solely on how tenacious the local people are about holding on to their own traditions.”

And to all those American divers still yearning to delight in Cayman’s fabled depths, the Governor added a gracious greeting: “Please come and enjoy yourselves. But please also respect our island and our way of life.” A fitting thought to take with you over The Wall.

Cayman Brac and Little Cayman are officially known as the Lesser Islands. Separated from each other by a narrow channel or “bogue” seven miles wide, the two islands lie

east-northeast of Grand Cayman. The distance between them and the larger, more populated island is approximately 90 miles, 45 minutes of flying time in Cayman Airways’ 15-passenger Britten-Norman Trislander and perhaps 20 years of “modern development” away.

The Brac is 12 miles long, a little more than a mile wide with a land area of 14 square miles. It has a population of just over 1600—most of mixed-blood Welsh or Scots descent, which is readily apparent in the broguish lilt in the speech of many of the inhabitants. The island’s most noticeable feature is a wedgelike spine of limestone rock that gradually rises up from almost flush with the beach on the western end of the island to a 140-foot cliff on the Brac’s eastern tip.

It is this “brac” (Gaelic for bluff or high place) that gave the island its name. Like the rest of the Cayman Islands, the Brac’s limestone geology is simply too porous to permit the existence of rivers or streams, so the population’s fresh water must come from either rain-filled cisterns or freshwater wells more than 1000 feet deep.

Little Cayman, west of Cayman Brac, is just under ten miles long and less than two miles at its widest point. It has a land area of only ten square miles. Unlike the Brac, Little Cayman is relatively flat; its highest elevation is only 40 feet above sea level. At the last census (1979), 46 persons were recorded to be residents of Little Cayman. So if you truly want to get away from it all, you’d be

hard pressed to find a better location.

The North Wall of Cayman Brac descends to an estimated 14,000 feet, while the south face drops to 18,000. In fact, the deepest known point in the Caribbean lies only 40 miles south of Cayman Brac, where a sounding of 24,724 feet was taken in the Cayman Trench.

As on Grand Cayman, the choice of a Cayman Brac dive site on a given day depends largely on the prevailing winds. Typically, you have a selection of either the North or South Walls for each morning's deep dive. The northern dropoff starts at 60 to 75 feet and is covered with a healthy crop of sponges. The South

dotted with limestone caves—which are good for a skinned knee and a scare or two before dinner, but little else.

But the Brackers, as they call themselves, are as warm and open as the travel brochures always seem to claim. They are a kindly and gentle people, tempered by the sea and inherently trusting of their fellow man. Few if any doors are ever locked on the Brac.

Now that most of the Brac's men-folk no longer have to ship off to sea to earn a living because there is work enough at the island's oil transfer station off the southwest point, there is a comfortable aura of domestic tranquility to the island that is almost palpable. And it is an aura that can grow on you—relaxing, reassuring, a perfect counterpoint to the exhilaration of the Brac's diving.

Of all the diving in the Cayman Islands, however, Little Cayman's is both the most remote and, at least by reputation, the best. A majority of the dive sites are located on the island's northwest shore, in two areas known as Bloody Bay and Jackson Point. In most places the wall starts at only 35 feet, and there is one location where it rises up to less than 20 feet below the surface.

But there is a problem: access. There are no land operators on Little Cayman, so the only way to dive there is to book a trip on the Brac's only dive boat for the 38-mile round trip from Cayman Brac over to the dive sites on Little Cayman's northwest shore. Unfortunately, the weather—or more specifically, the wind—does not always cooperate. Two-foot seas in the lee of the Brac mean four-foot seas on its windward side and waves as high as eight feet in the bogue between the two islands—enough to turn even the hardest-core diver a little green around the gills during the two-hour passage.

It is said if you stay at Cayman Brac more than three days during the winter season, you will have perhaps an 80-percent chance of making it to Little Cayman for a day of diving. And during the summer your chances are even better. Depending on the number of divers who want to go, however, there may be a small surcharge, typically \$10.

If the winds or your time schedule don't enable you to dive Little Cayman from Cayman Brac, do not despair. You can always try again on your next trip to the Lesser Islands. Because after you've visited once—and enjoyed the Caymanian proof of the saying "less is more"—it's likely you'll be back again. ☺



STEPHEN FRANK

An unrelenting surf pounds a rocky jut out of the Brac coastline.

Wall reaches up to 50 to 65 feet on each end of the island, but its rim begins at even shallower depths in the middle of the island. As a rule, the Brac's South Wall is slightly more vertical than the North and has a greater variety of corals. Cut by fissures and sand gullies, both walls are riddled with tunnels and caves. And the quantity and quality of wildlife off Cayman Brac equals anything found on the main island.

Shoreside, however, is another story. If the night life on Grand Cayman leaves you yawning, Cayman Brac will clearly put you to sleep. On weekends a local band works out at a small club on the south road, but a typical evening on the Brac means you'll be in bed by 10 p.m. Rent a Honda 90 for two hours and you can trace every road on the island. For the compulsively adventuresome, the eastern portion of the island's bluff is

Bob Soto's Diving Ltd./Lobster Pot Headquarters/
Ronald Kipp
 Box 1801, Grand Cayman, BWI
 Phone: 92483

Bob Soto's Diving Ltd./Beach Club Colony Resort/
Ronald Kipp
Box 1801, Grand Cayman, BWI
Phone: 92023, ext. 9

Bob Soto's Diving Ltd./Grand Caymanian Holiday Inn/
Ronald Kipp
 Box 1801, Grand Cayman, BWI
 phone: 94091, ext. 6, (800) 327-4069 (US)
 (305) 592-8175 (FL)

Bob Soto's Diving Ltd./Cayman Islander Hotel/
Ronald Kipp
 Box 1801, Grand Cayman, BWI
 Phone: 95533 ext. 1 (800) 327-6840 (US),
 (305) 652-9716

Casa Bertmar Diving Resort/Kent and Angela Eldemire
Box 637, S. Church St., Grand Cayman, BWI
Phone: 92514. Cable: Bertmar

M.V. Cayman Diver
c/o Sea and Sea Travel Service/
Capt. Jerry Jones/Carl Roessler
Box 350127, Ft. Lauderdale, FL 33335
Phone: (305) 983-0599, (415) 771-0077

Cayman Diving Lodge/Gerry Hytha and Eric Heindl
241 E. Commercial Blvd., Ft. Lauderdale, FL 33334
Phone: (305) 491-0333, (800) 432-8894(FL),
(800) 327-8223 (US)

Cayman Kai Resort, Ltd./Gene DeMarco
Hotel Plans, Inc., 1200 Harger Rd. Oakbrook, IL. 60521
Phone: (800) 323-7600, (312) 877-8088

Dive Cayman Ltd./Peter Milburn
Box 596, Grand Cayman, BWI
Phone: 72189, 95341

F.L.A.G. Royal Palms Diving Service/Glenn Galtore
Box 490, Grand Cayman, BWI
Phone 92636, ext. 70

F.L.A.G. Underwater Services, Ltd./Gerry Willcocks
Box 446, Grand Cayman, BWI
Phone: 92606

Quabbin Dives (Cayman) Ltd./Athlee Evans
Box 157, Grand Cayman, BWI (send air mail)
Phone 95597. (809) 949-5597

SeaSports/Capt. Butch Sjostrom
Box 1516, Grand Cayman, BWI
Phone: 94430

Scuba Cayman, Ltd./Clinton Ebanks
Box 746, Grand Cayman, BWI
Phone: 93873

Sunset House/Adrien and Bonnie Briggs
Box 479, Grand Cayman, BWI
Phone: 95966

Surfside Watersports/Will Mannon
Box 891, Grand Cayman, BWI
Phone: 92724, 94478

Tortuga Club/Frank Conolly
Box 496, Grand Cayman, BWI
Phone: 742888

Undersea Photo Supply of Cayman/Ron Meiselman
Box 1551-SD, Selkirk Plaza, W. Bay Rd.,
Grand Cayman, BWI
Phone: 94686

Brac Aquatics, Ltd./Winston McDermot
West End Post Office, Cayman Brac, BWI
Phone: 87429

GRAND CAYMAN

GENERAL

Location: 480 miles south of Miami and 178 miles northwest of Jamaica
 Size: 76 square miles
 Topography: a flat island with sloping beaches, rocky coastline, seaside cliffs
 Climate: tropical with 62 inches of annual precipitation
 Population: 16,677
 Largest towns: capital, George Town
 Language: English
 Ethnic composition: 20% black; 20% white; 60% mixed
 Economy: 3% agricultural, 20% industrial, 35% tourism; major exports: 25% finance, 18% government
 Monetary unit: Cayman dollar = \$1.20
 Diving season: year-round
 Tourist season: year-round

DIVING

Water temperature: summer 80-82, winter 78-80 °F
 Visibility: 130-140 feet, rainy season Sept-Nov reduces visibility to 110-120 feet
 Depth of dives: 0-130 feet
 Types of diving: reef, wreck, wall, night, cave, drift, beach, spearfishing, spearfishing not permitted with tanks
 Skill level: novice, intermediate, advanced
 Sights: Fish: snapper, grouper, angel, triggerfish, sergeant major, trumpetfish, barracuda, Coral: star, elkhorn, staghorn, wall, tunnel, cave, black coral, brain coral
 Sponges: glass vase, tube, covering sponge, basket
 Shells: conch, helmet, flamingo tongue, murex, bonnet
 Invertebrates: lobster, conch, crab, octopus, squid, star, sea cucumber
 Other: dolphin, turtle, eel, shark, ray
 Restrictions: no collecting or fishing with tank & speargun; lobster in season; ten conch per person, per day

DIVING SERVICES

Instruction available: resort course, open-water certification, advanced open-water certification, underwater photography
 Equipment rental: mask, fins, snorkel, weight belt, weights, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, full wetsuit, partial wetsuit, knife, game bag, dive light, Nikonos, camera housing, underwater strobe
 Equipment sales: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, full wetsuit, partial wetsuit, knife, game bag, dive light, Nikonos, camera housing, underwater strobe
 Equipment repair: extensive
 Camera repair: extensive
 Air: yes
 Guides: yes

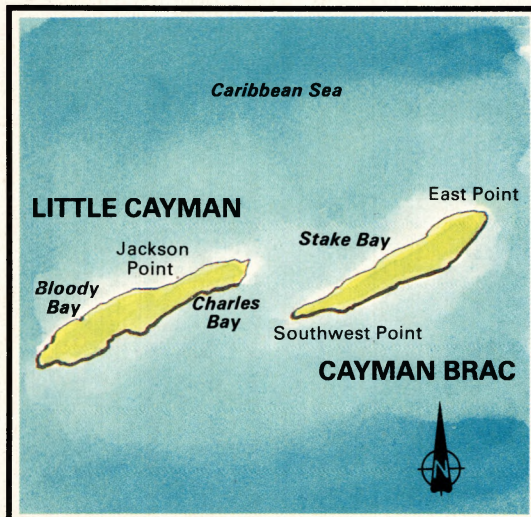
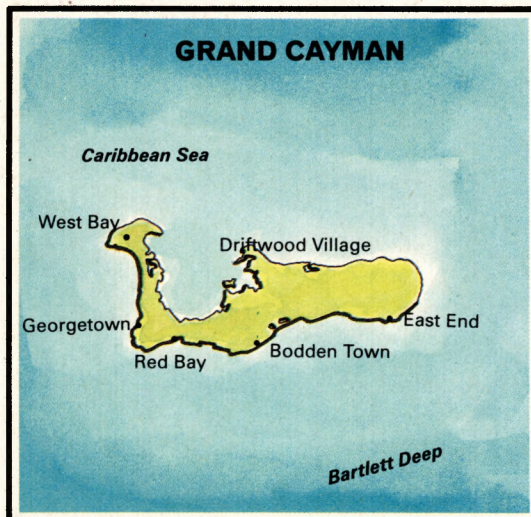
DIVERSIONS

Ground transportation: bus, taxi, rental car, motorbike, bicycle
 Shopping: excellent and reasonable
 Restaurants: excellent and reasonable, average meal \$8-15
 Nightlife: nightclubs in hotels, cinema, theatre
 Other sports: sailing, fishing, windsurfing, tennis, water skiing, cricket, rugby, bicycling
 Don't Miss: Hell, North Wall, Turtle Farm, wreck of *Balboa*, Wreck of *Oro Verde*, Welly's Cool Spot

JUST IN CASE...

Hospitals: Cayman Islands Hospital, George Town ph: 92121, 95555
 Diving doctors: Dr. James Poison, Cayman Clinic, George Town, ph: 94234, 92060

SPORT DIVER DESTINATION DATA



CAYMAN ISLANDS

Recompression facilities: Cayman Clinic, George Town ph: 94234
 Police: ph: 999
 Marine Rescue: ph: 94222
 American Express: Bank of Nova Scotia, George Town ph: 92381
 U.S. Consulate: nearest is Kingston, Jamaica

ON YOUR OWN

Land tours: Cayman Island Taxi Association
 Airlines: Cayman Airways, 250 Catalonia, Coral Gables, FL (305) 526-5470
 Red Carpet Airlines, St. Petersburg-Clearwater Airport, Clearwater FL, (800) 237-3803;

Republic Airlines, Box 592173, Miami FL, 33159 (305) 526-6558
 Pilots info: Owen Roberts International Airport, Division of Civil Aviation, ph: 92811
 Fuel: yes
 Lighted runway: yes
 Repairs: yes, limited
 Aeronautical Chart Number: L-5; H-1
 Marinas: Harbour House Marina, Box 850 George Town, ph: 92007
 Chart Number: L-5; H-1
 Hotels with dive packages:
 Beach Club Colony, Box 903, West Bay Road, Grand Cayman, ph: 92023; Casa Bertmar Hotel & Diving Resort, Box 637, South Church Street, Grand Cayman, ph: 92514; Cayman Diving Lodge, Box 11, East End, Grand Cayman, ph: 72483; Cayman Islander Hotel, Box 509, West Bay Road, Grand Cayman, ph: 95528; Cayman Kai Resort Ltd, Box 1112, North Side, Grand Cayman, ph: 72573; Holiday Inn, Box 904, West Bay Beach, Grand Cayman, ph: 94091; Royal Palms of Cayman Hotel, Box 490, West Bay Beach, Grand Cayman, ph: 92636; Tortuga Club, Box 496, East End, Grand Cayman, ph: 72488
 Customs and Immigration requirements: passport; US citizens, voter registration card or birth certificate
 Import restrictions: animals and plants require US Dept. of Agriculture permit; illegal drugs prohibited
 How much cash may you bring into the country? unlimited
 Export restrictions: no tropical fish, limits on liquor
 How much native currency may you take out of the country? no limit
 U.S. Customs re-entry restrictions: no agricultural products or uncertified turtle products
 Diving clubs and associations: Cayman Islands Divers, Box 1515, Grand Cayman

CAYMAN BRAC/ LITTLE CAYMAN

DIVING

Water temperature: summer 80-85, winter 75-80 °F
 Visibility: 120-130 feet, rainy season Sept-Nov reduces visibility to 80-100 feet
 Depth of dives: 30-100 feet
 Types of diving: reef, wreck, wall, night, cave, drift, beach, spearfishing (spearfishing permitted while free-diving)
 Skill level: novice, intermediate, advanced
 Sights: Fish: grouper, snapper, angel, grunt, parrot, barracuda, shark, ray, squirrel, triggerfish
 Coral: elkhorn, staghorn, star, brain, finger, gorgonia, black
 Sponges: tube, basket, vase
 Shells: conch, flamingo tongue, cowrie
 Invertebrates: star, sea cucumber, octopus, squid, jellyfish, worms, eel
 Restrictions: no collecting or fishing on scuba; season for lobster; ten conch per person, per day

DIVING SERVICES

Instructions available: resort course, open-water certification, advanced open-water certification, underwater photography
 Equipment rental: mask, fins, snorkel, weight belt, weights, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, full wetsuit, partial wetsuit, knife, game bag, dive light
 Equipment sales: none
 Equipment repair: limited
 Camera repair: minimal
 Air: yes
 Guides: yes

SUNSET HOUSE— GEORGETOWN, GRAND CAYMAN ISLAND

South Church Street, Grand Cayman, B.W.I. Phone: 95966.

RESERVATIONS: Sunset House, c/o Adrien Briggs, Post Office Box 479, South Church Street, Grand Cayman, B.W.I. Phone overseas operator: 95966.

LOCATION—The hotel and apartments are situated on the leeward (west) side of the island with 450' ocean front. One mile south of Georgetown and five minutes from Owen Roberts Airport.

TRANSPORTATION—Air: Cayman Airways, Republic Airways from Miami and Cayman Airways from Houston. Ground: taxi from airport, \$7.00 for two people, major car rentals available at airport, downtown or arranged through hotel.

ACCOMMODATIONS—Thirty-nine air-conditioned double rooms fully furnished with either balcony or terrace. All have private bath, two units have kitchen facilities. Twelve rooms and two one-bedroom apartments are brand new. Newly constructed restaurant enables hotel to handle one-hundred diners. Complete facilities include main buildings, restaurant, thatched roof oceanfront bar (recently expanded) and complete dive shop. The original house, constructed by local craftsmen 100 years ago of mahogany and hardwoods, is still considered a local landmark. Resort is situated within the capital city of Georgetown, renowned for its freeport shopping with duty free items from around the world. Recreational activities include fishing, boating, snorkeling and scuba diving. Rates: rooms, single \$60-70 (summer MAP), double \$80-90 (summer MAP), suites with kitchen facilities, sleeps four \$96 (summer EP). Thirty-one units can be rented either single or double. Amerex, MasterCharge and Visa cards accepted. 15% gratuity and five per cent government tax will be added.

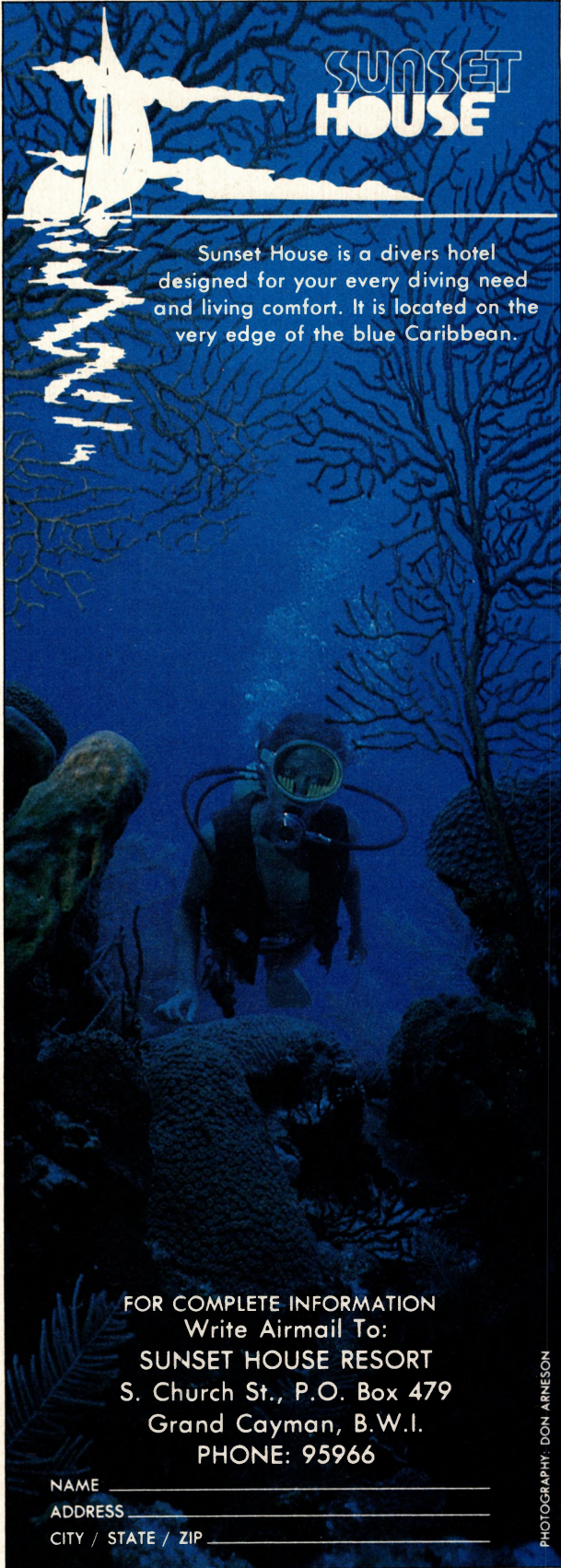
DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift Dives no
Mid reef yes	Wrecks yes	Night Dives yes
Deep reef yes	Caverns yes	Beach Dives yes

DIVING EQUIPMENT—Rix and Worthington compressors, 5000 PSI. Two hundred 72 cu/ft aluminum tanks. Two dive boats include 35' LCVP with a twenty-five diver capacity and 32' launch with a fifteen diver capacity. VHF radio allows vessels to be in constant communications with resort. Full service dive shop is brand new and offers full line of retail sales and basic equipment for rental use. Rental rates include tank/bak pac \$5.00/day, mask/snorkel/fins \$3.75/day, weight belt with lead \$1.00/day, regulator with pressure gauge \$4.00/day, underwater light \$7.00/day, BC vest \$3.75 day. Resort has film in stock, can make minor camera repairs and twenty-four hour Ektachrome photo processing available.

DIVING SERVICES—PADI affiliation. Three instructors/divemasters are CPR first aid trained. All instructors are certified and have years of local experience. Resort course and full certification available. Rate depends on individual requirements and equipment provided. Cost for half day diving (two tanks) \$25.00, cost for full day diving (four tanks) dependent on package price and individual requirements, cost for night dive \$25.00. Rate includes tank, bac pac, air, weight belts and lead, boat and divemaster. Dives are preplanned to insure maximum time underwater. Complete briefing before dives to determine individual skill level and interest. Boats and docks are short walk from dive shop. All boats have licensed captains and are US Coast Guard approved. Special group requirements such as underwater photography, marine biology, night dives, etc., can be arranged through the resort. Please write in advance for special arrangements. Hundreds of dive sites in the Cayman Islands include the Balboa wreck, Trinity Caves, The Tunnels, Eden Rock Drop Off, Eagle Bay Rock, Tarpon Alley, Armchair Reef, Frank's Reef, Angel Reef and Eden Rocks. The marine life and reef formations of these dive sites are ideal for underwater photographers.

DIVING PACKAGES—4 day/3 night minimum packages are tailored to suit individual and group requirements. Longer stay packages are also available. Price range depends on package. New facility enables hotel to accommodate larger groups. Includes accommodations based per person double occupancy (single rates available, as are non diver rates), two meals daily, gratuities, taxes, tanks, bac pac, weight belt, air, boat, guide and two tanks daily. Also includes airport transfer, unused portions non-refundable. For complete prices, rates and other information, write or call today for free brochure to above reservations addresses.



SUNSET HOUSE

Sunset House is a divers hotel designed for your every diving need and living comfort. It is located on the very edge of the blue Caribbean.

FOR COMPLETE INFORMATION
Write Airmail To:
SUNSET HOUSE RESORT
S. Church St., P.O. Box 479
Grand Cayman, B.W.I.
PHONE: 95966

NAME _____
ADDRESS _____
CITY / STATE / ZIP _____

PHOTOGRAPHY: DON ARNESON

BOB SOTO'S DIVING LTD.— GRAND CAYMAN ISLAND

North Church Street, Georgetown, Grand Cayman, B.W.I. Phone: 92482

RESERVATIONS—Bob Soto's Diving Ltd. c/o Ronald L. Kipp, President, P.O. Box 1801, Grand Cayman, B.W.I.

LOCATION—Main headquarters located beneath the famous Lobster Pot Restaurant on North Church Street, south of Georgetown. Other locations featured on these two pages.

TRANSPORTATION—Cayman Airways from Miami and Houston, Republic from Miami.

ACCOMMODATIONS—Working with two hotels on Seven Mile Beach and one across the street from the beach, Bob Soto's can arrange for a variety of rooms from several price ranges. Some have balconies or terraces, some with carpet, all with air conditioning. Rates vary depending on the season and type of accommodations. Major credit cards are accepted. Rates do not include 5% government room tax or 10% service charge.

DIVING AVAILABLE—

Shallow reef **yes**

Mid reef **yes**

Deep reef **yes**

Walls **yes**

Wrecks **yes**

Caverns **yes**

Drift dives **no**

Night dives **yes**

Beach dives **yes**

DIVING EQUIPMENT—Modern Mako compressors, (3) with specially designed air filtration and storage system, 3000 PSI. Combination of both 72 cu/ft and 80 cu/ft aluminum tanks. Special 72 cu/ft steel tanks for photographers. 3 dive boats include 64' Holiday Diver, 51' Reef Diver, 32' Paradise Diver.

DIVING SERVICES—Bob Soto's is the oldest and most experienced dive operation in the Caribbean. 9 instructors/divemasters with multiple certification ratings represent all major certification agencies. CPR, first aid and life saving trained. Two-tank experienced dive \$27.50, one tank \$20, night dive \$25. Special all day two tank North Wall trip \$37.50.

DIVING PACKAGES—4 day/3 night and 8 day/7 night package available for individuals or couples. Special Reef Diver package available for dive store/clubs/groups with accompanying instructor for at least 20 divers.

CAYMAN ISLANDER— GRAND CAYMAN ISLAND

P.O. Box 509, Grand Cayman, B.W.I. Phone toll free: (800) 327-6840.

RESERVATIONS—Cayman Islander, 18361 NE 2 Avenue, Miami, FL 33179. Phone toll free: (800) 327-6840 (U.S.) or (305) 652-9716.

LOCATION—Hotel and dive shop are situated across the street from Seven Mile Beach on the outskirts of Georgetown.

TRANSPORTATION—Air: Cayman Airways from Houston and Miami; Republic from Miami. Ground: taxi from airport \$5, car rentals in town.

ACCOMMODATIONS—Forty-three air conditioned rooms each with private patio and pool or lake view. Each room has private bath and two double beds. Hotel has poolside bar, restaurant, freshwater pool, sun terrace. Rates: (May 1 - Nov. 30, 1981) single or double \$39 EP, (Dec. 1981 - Apr. 30, 1982) single \$58, double \$65(EP), extra person \$9. Government room tax 5%, service charge 10% extra. American Express, Master Charge and Visa accepted.

DIVING AVAILABLE—

Shallow reef **yes**

Mid reef **yes**

Deep reef **yes**

Walls **yes**

Wrecks **yes**

Caverns **yes**

Drift dives **no**

Night dives **yes**

Beach dives **yes**

DIVING EQUIPMENT—Modern Mako compressors, (3) with specially designed air filtration and storage system, 3000 PSI. Combination of both 72 cu/ft and 80 cu/ft aluminum tanks. Special 72 cu/ft steel tanks for photographers. 3 dive boats include 64' Holiday Diver, 51' Reef Diver, 32' Paradise Diver.

DIVING SERVICES—Bob Soto's is the oldest and most experienced dive operation in the Caribbean. 9 instructors/divemasters with multiple certification ratings represent all major certification agencies. CPR, first aid and life saving trained. Two-tank experienced dive \$27.50, one tank \$20, night dive \$25. Special all day two tank North Wall trip \$37.50.

DIVING PACKAGES—4 day/3 night and 8 day/7 night package available for individuals or couples. Special Reef Diver package available for dive store/clubs/groups with accompanying instructor for at least 20 divers.

DIVE CAYMAN

Bob Soto's

COMPLETE SERVICES
& EQUIPMENT

SCUBA TWO TANK DIVE

Leaves at 9:00 AM

SCUBA ONE TANK DIVE

Leaves at 2:00 PM

ALL DAY NORTH WALL TRIP

Two Tank Dive

SCUBA NIGHT DIVE

Wreck of the Balboa

SALES, SERVICE & RENTALS

Scubapro or Dacor Dealer



INSTRUCTION

Resort course to full certification

SNORKELING TRIP

Shallow reefs

GLASS BOTTOM BOAT TRIP

See the reef from our boat

WATER SPORTS

Sailboats or windsurfing

CHARTER FISHING

Half or full day trips

When you are looking for convenience, professionalism and safe fun—look for the Diving Turtle.

DIVING LTD.

P.O. Box 1801, Grand Cayman, BWI

Telephone: 92483

Circle #26 on reader service card.



Cayman Islander

Grand Cayman's
Newest and
Friendliest Hotel

SCUBA DIVER'S HOLIDAY PACKAGE

4 DAYS/3 NIGHTS or 8 DAYS/7 NIGHTS

- A/C rooms: private patio with pool or lake view
- Complimentary pool and beach facilities with lounges and towels
- Welcome Cayman cocktail
- Souvenir T-shirt
- Four free drink doubloons
- (3) one tank dives daily

Dives include tanks, weights, belts, backpack, round-trip transfers to boat, scuba guide and boat trip.
for more information and rates, contact:

Cayman Islander
18361 NE Second Avenue
Miami, Florida 33179
800 327-6840 (U.S.)
305 662-9716 (Fla.)

Bob Soto's
DIVING LTD.

Circle #24 on reader service card.

GRAND CAYMANIAN HOLIDAY INN— GRAND CAYMAN ISLAND

Seven Mile Beach, Georgetown, Grand Cayman, B.W.I. Phone: 94091

RESERVATIONS—Grand Caymanian Holiday Inn, 7220 NW 36th Street, Suite 205, Miami, FL 33166. Phone toll free 800/327-4069 (U.S.) or 305/592-8175 (FL).

LOCATION—Hotel and dive store are located directly on world famous Seven Mile Beach overlooking West Bay.

TRANSPORTATION—Cayman Airways from Miami and Houston, Republic from Miami.

ACCOMMODATIONS—215 spacious air conditioned rooms. Full resort hotel has gourmet dining at Chez Jacques, several restaurants, pool bar and entertainment. Dive boats depart from beach at 9:00 AM and 2:00 PM, all major certification cards accepted. Rates: (May 1 - Nov. 30) single \$64-94, double \$68-98. Plus energy surcharge of \$3 per day per room, 5% government room tax, 10% service charge in lieu of gratuities. Major credit cards.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Modern Mako compressors, (3) with specially designed air filtration and storage system, 3000 PSI. Combination of both 72 cu/ft and 80 cu/ft aluminum tanks. Special 72 cu/ft steel tanks for photographers. 3 dive boats include 64' Holiday Diver, 51' Reef Diver, 32' Paradise Diver.

DIVING SERVICES—Bob Soto's is the oldest and most experienced dive operation in the Caribbean. 9 instructors/divemasters with multiple certification ratings represent all major certification agencies. CPR, first aid and life saving trained. Two-tank experienced dive \$27.50, one tank \$20, night dive \$25. Special all day two tank North Wall trip \$37.50.

DIVING PACKAGES—4 day/3 night and 8 day/7 night package available for individuals or couples. Special Reef Diver package available for dive store/clubs/groups with accompanying instructor for at least 20 divers.

BEACH CLUB COLONY RESORT— GRAND CAYMAN ISLAND

P.O. Box 903, Grand Cayman, B.W.I. Phone toll free: 800/327-8777.

RESERVATIONS—Cayman Island Reservation Service, 205 Catalonia Ave., Coral Gables, FL 33134. Phone toll free: 800/327-8777 or 800/432-4858. Or Robert Reid & Associates 212/757-2444.

LOCATION—Hotel and dive shop located directly on Seven Mile Beach on west side of island. 15 minutes from airport.

TRANSPORTATION—Cayman Airways from Miami and Houston, Republic from Miami.

ACCOMMODATIONS—Forty-one air conditioned rooms each with private balcony and ocean or garden view. Two restaurants, disco and bar. Complete services include car rental, dry cleaning, house physician, hotel safe, taxi service and baby-sitting. Full sports program include sailing, scuba diving, snorkeling, tennis and boating. Rates: summer (EP) single \$52-60, double \$57-65, triple \$82-90. Children under 12 free, 5% government room tax, 10% service charge in lieu of gratuities. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Modern Mako compressors, (3) with specially designed air filtration and storage system, 3000 PSI. Combination of both 72 cu/ft and 80 cu/ft aluminum tanks. Special 72 cu/ft steel tanks for photographers. 3 dive boats include 64' Holiday Diver, 51' Reef Diver, 32' Paradise Diver.

DIVING SERVICES—Bob Soto's is the oldest and most experienced dive operation in the Caribbean. 9 instructors/divemasters with multiple certification ratings represent all major certification agencies. CPR, first aid and life saving trained. Two-tank experienced dive \$27.50, one tank \$20, night dive \$25. Special all day two tank North Wall trip \$37.50.

DIVING PACKAGES—4 day/3 night and 8 day/7 night package available for individuals or couples. Special Reef Diver package available for dive store/clubs/groups with accompanying instructor for at least 20 divers.

the GRAND CAYMANIAN

Nestled peacefully amidst the beautiful British West Indies lies one of the Caribbean's best kept secrets—the Grand Caymanian

OFFERING THE BEST OF SERVICES

217 spacious A/C rooms—Located on beautiful 7 mile beach

4 lighted tennis courts—Finest bars and restaurants

One hour flight from Miami—Chez Jacques, world famous gourmet restaurant

Hottest bar on island—

Wreck of the Ten Sails

Live entertainment by

"The Barefoot Man"

Complete water sports offered

by Bob Soto's Diving Ltd.

include diving, fishing

and sailboat rentals

You'll find our staff one of the most efficient and professional in the diving travel and hotel industry, dedicated toward one goal—to show the best possible time to our most important guest—YOU.

For more information and rates contact:

Grand Caymanian Holiday Inn

Suite 205, 7220 NW 36th Street

Miami, Florida 33166

305/592-8175



Holiday Inn
International
Beach Resorts™

Bob Soto's
DIVING LTD.

Circle #32 on reader service card.

THE
**BEACH
CLUB**
RESORT



Bob Soto's
DIVING LTD.

offering the best group dive package in 1981
on board the "REEF DIVER"

★Arrival briefing by management of Bob Soto's Diving and introduction of your divemaster—diving plan outlined and questions answered.

★Exclusive use of the Reef Diver dive boat by your group.

★Your group may consist of twenty (20) divers plus two (2) divemaster/instructors/tour leaders—your divemasters must assist in dive planning, briefing, divemastering, loading, unloading, etc.

★Beach pick-up and delivery.

★Dive boat, divemaster, tanks, backpacks, weight belts and weights furnished.

★Six days of scuba diving—seventeen (17) scuba dives!

★Assistance in hotel, dining or ground arrangements.

★Available only to qualified dive shops, agents or dive clubs.

★Total cost is only \$3000. \$1000 deposit required to block Reef Diver dive boat for your group. 10% agents commission promptly paid. Additional cost of \$300 if two (2) Bob Soto's divemaster/instructors must be utilized. All prices in U.S.A. \$ and no taxes or gratuities are added.

For more information and rates, contact:

The Beach Club Resort

P.O. Box 903

Grand Cayman, BWI

Phone: 92023 Telex: CP 253

Bob Soto's Diving Ltd.

P.O. Box 1801

Grand Cayman, BWI

Phone 92483

Circle #33 on reader service card.

CAYMAN KAI RESORT— NORTHSIDE, GRAND CAYMAN ISLAND

P.O. Box 1112, Grand Cayman, B.W.I. Phone: 72573.

RESERVATIONS: Hotel Plans, Inc., 1200 Harger Rd., Oakbrook, IL 60521. Phone: (312) 887-8088 or toll free: 323-7600.

LOCATION—Resort is on 400 acre property with 5 miles of waterfront on north coast of island. 26 miles from airport and town.

TRANSPORTATION—Air: Cayman Airways from Miami and Houston, Republic from Miami. Ground taxi from airport \$30, courtesy pickup with 5 or more nights stay. Bike and car rentals at property.

ACCOMMODATIONS—26 one and two bedroom sea lodges, 20 one to four bedroom beach villas with spacious bath, kitchen, living and dining rooms, porch and patio. Resort has restaurant, bar, weekly entertainment, waterskiing, tennis, boating, fishing and snorkeling. Rates: single \$51 (summer), \$89 (winter), double \$96 (summer), \$168 (winter); villas \$67-125 (summer), \$106-229 (winter). Amex, Visa and MasterCard accepted.

DIVING AVAILABLE—

Shallow reef **yes**

Mid reef **yes**

Deep reef **yes**

Walls **yes**

Wrecks **no**

Caverns **no**

Drift dives **yes**

Night dives **yes**

Beach dives **no**

DIVING EQUIPMENT—Mako and Worthington compressors, 5000 PSI, 100 tanks 72 cu/ft, 5 dive boats including (2) 28' flattop with 16 diver capacity, (3) 22' Aquasports w/8 diver capacity each. Full retail sales and complete line of rental gear. U/W camera \$15/half day, U/W flash \$18 half day, film in stock, limited camera repair.

DIVING SERVICES—PADI, NAUI affiliation. 4 instructors/dive-masters. CPR first aid trained. Resort course CI\$50. Cost half day diving (1 tank) CI\$18 full day diving (2 tanks) CI\$36, night dive CI\$22.50. Boat and divemaster included in rate.

DIVING PACKAGES—4 days/3 nights \$232 (summer), \$280 (winter), rates per person double occupancy. Includes accommodations, 2 meals daily, maid service, two dives daily, airport transfers, welcome drink and other options. Non diver allowance available. IT9EA1 CKSH.



**Come dive with the
only full-service resort
that dives the famous
North Wall every day.**

Circle #27 on reader service card.

SPANISH BAY VILLAS— NORTHWEST, GRAND CAYMAN ISLAND

P.O. Box 1200, Grand Cayman, B.W.I. Phone: 93272.

RESERVATIONS: Have your travel agent contact: Cayman Islands Reservation Service, 250 Catalonia Ave. #604, Coral Gables, FL 33134. Phone toll free: (800) 327-8777 (except FL (800) 432-4858). Or Cayman address, send airmail.

LOCATION—Villas are on Northwest shore of island, adjacent to Spanish Bay Reef. 20 minutes from airport, 15 minutes from town.

TRANSPORTATION—Air: Cayman Airways, Republic from Miami & Houston. Ground: taxi from airport \$15, rental cars, mopeds and bikes available on request.

ACCOMMODATIONS—Twelve apartments, either one or two bedrooms. Completely furnished, all electric kitchens, ceiling fans throughout, with private deck or patio. All apartments face the sea and thatched cabana. Freshwater swimming pool, restaurant and bar privileges at adjacent resort for all guests. Rates: \$48 (EP) for 2 people in one bedroom apt.; \$72 (EP) for 4 people in two bedroom/bath apt. Amex, Visa, MasterCard accepted.

DIVING AVAILABLE—Facilities at Spanish Bay Reef Resort, adjacent. Details furnished upon request.

Shallow reef **yes**

Mid reef **yes**

Deep reef **yes**

Walls **yes**

Wrecks **yes**

Caverns **yes**

Drift dives **no**

Night dives **yes**

Beach dives **yes**



Spanish Bay Villas

CONDOMINIUMS FOR DIVERS



Circle #39 on reader service card.

THE TORTUGA CLUB— EAST END, GRAND CAYMAN ISLAND

P.O. Box 496, Grand Cayman, B.W.I. Phone: 7-2488.

RESERVATIONS: The Tortuga Club, P.O. Box 496, Grand Cayman, B.W.I. Phone: 7-2488. Or the The Tortuga Club, c/o Marion Barich, 162 Main St., Salinas, CA 93901.

LOCATION—Club is 5 acre property on east end of island with 800' of beachfront. 25 miles from airport and town.

TRANSPORTATION—Air: Cayman Airways from Miami and Houston. Republic from Miami. Ground: courtesy car pickup, rental cars at hotel.

ACCOMMODATIONS—14 air conditioned double rooms with private bath, freshwater showers and terraces. Club is only hotel on windward side of island, self sufficient with restaurant, bar and lounge. Waterskiing, fishing, tennis, sailing, shuffleboard and bicycles available. Rates: single \$85, double \$59 pp, triple \$49 pp, price includes 2 meals daily. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives yes
Mid reef yes	Wrecks no	Night dives yes
Deep reef yes	Caverns no	Beach dives no

DIVING EQUIPMENT—Worthington and Mako compressors, 3500 PSI. Sixty tanks 72 cu/ft. Three dive boats (all recently refurbished) include 34' custom built diesel, 22' Aquasport, 19' Whaler with total diver capacity of twenty-six and under new management. Retail sales and rental gear are available. Underwater camera is \$25 per day, film is in stock and forty-eight hour processing of film is available.

DIVING SERVICES—PADI affiliation. One instructor and two divemasters. Resort course \$55, full certification \$150, advance course \$50. Cost half day diving (2 tanks) \$29, full day rates available, night dive \$25 (light \$5). Tanks, bac pac, weight belt included in rate, other gear available on request.

DIVING PACKAGES—Single \$74, double \$59, quad \$49. Rates are per person day, two meals daily, Cost of diving included in rate. For complete information on special diving packages, contact above address.

Circle #136 on reader service card.



The Tortuga Club

Easy access to the famous North Wall!

Box 496, Grand Cayman, B.W.I., Phone 7-2488



CAYMAN DIVING LODGE— EAST END, GRAND CAYMAN ISLAND

East End, Grand Cayman, B.W.I.

RESERVATIONS: Call or write Airtour Universal Inc., 241 E. Commercial Blvd., Ft. Lauderdale, FL 33334. (305) 491-0333, FL toll free: (800) 432-8894. Nationwide: (800) 327-8223. All US.

LOCATION—Lodge is located on southeast end of island, directly on the waterfront and beach. 18 miles from airport in center of East End.

TRANSPORTATION—Cayman Airways from Miami and Houston. Republic from Miami. Ask for special air fares from the West Coast and Northeast. Ground: courtesy car pickup for groups, car rentals in town.

ACCOMMODATIONS—18 air-conditioned rooms. Restaurant and bar on premises. Continual sea breeze, porches overlook ocean. Windsurfing, fishing, waterskiing, snorkeling. Rates from \$54 pppd (summer). \$5 for A/C per room. 10% service charge, 5% government tax, major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives no

DIVING EQUIPMENT—2 Mako, 1 Bauer Compressor, 3000 PSI. 50 72 cu/ft, 50 80 cu/ft aluminum. 3 boats, 36' for 15 divers, 26' for 12 and 24' for 10. Guaranteed daily diving. Full service retail store with rentals.

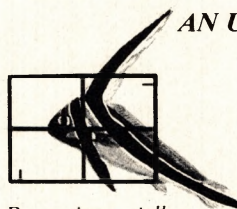
DIVING SERVICES—All major certifications. 2 instructors/2 divemasters and chamber operator, CPR first aid trained. Resort course \$50. Full certification \$250. Cost half day diving (2 tanks) \$27.50 night dive \$27.50 (with light). Basic gear included in rate.

DIVING PACKAGES—7 nights form \$378 per week. Includes accommodations (d/o). 2 meals/day, free courtesy airport transfer, 2 tank dive daily and basic gear.

U/W PHOTOGRAPHY—Complete U/W photography and movie courses by professionals available on a regular basis. Write in advance as classes are limited to 10. Complete U/W photo rentals with cameras, lenses and all accessories.

CAYMAN DIVING LODGE

East End Grand Cayman, B.W.I.



AN U/W PHOTOGRAPHER'S
RESORT

Lodge has been specially redesigned to handle all U/W Photography needs from 35mm, 16mm to Video Tape. Courses are taught by professionals on a regular basis.

Resort is specially designed for divers by divers.



Circle #50 on reader service card.

Instruments in Combo and Consoles

*The best underwater insurance you can get
is good information. Here's how.*

BY JON HARDY AND BURGE HULETT
PHOTOGRAPHY BY TIM MORIARTY







Recreational divers in the 1950s were lucky. Lucky to have discovered underwater adventures and lucky to have survived the whims of primitive equipment and guesswork. Now things are different.

In diving's early years it was impossible to accurately plan a dive; few good underwater instruments made it prohibitive. Divers at the time had to rely on sonic warning devices or J-valves to tell them when to surface. Some simply let their tanks empty and made emergency ascents. Either way it was seat-of-the-pants planning — an approach guaranteed to make safety-conscious divers anxious. Technology and forward-thinking manufacturers changed that by producing accurate underwater instruments that required no guesswork. The biggest step ahead, then, was the submersible pressure gauge. Today it's standard on all new regulators.

Jon Hardy is Sport Diver's Product Editor. Burge Hulett is a writer from Reno working on a book about Nevada politics.

Along with a depth gauge, the pressure gauge should be universal equipment for sport divers. Sonic devices and J-valves remain, though now in back-up status. Some divers prefer a basic pressure/depth gauge unit — called a combo — while others like more elaborate instrument packages housed in tough consoles. Both provide enough information to plan a safe diving trip.

Gauge Reading

Instruments in combos or consoles are data-producing devices. However, to take advantage of the data divers must know how to read their gauges. The point of multiple instruments, with duplicated use by several divers, is to get comparative readings. It is the only correct way to plan a dive.

Comparative readings are crucial. As good as modern instruments are, they aren't perfect. A gauge is tuned as close to perfect accuracy as possible when manufactured. The minute it's used it begins to lose that fine edge. After being banged around for a few months, accu-

racy is reduced to a good estimate. But a slightly used gauge is still better than old-style guesswork.

That shouldn't be taken as an endorsement of inaccurate instruments but rather as a statement of equipment life. For example, a reading of three-quarters or half a full tank on a submersible pressure gauge is better than an audible warning valve or an almost-empty tank. The same point is better expressed with depth gauges.

It is an unwise diver who takes a depth gauge reading as gospel. Confining dives to less than 100 feet and pausing in shallow water before returning to the surface are good hedges against a faulty gauge. Divers who follow these methods reduce any hazard caused by inaccurate or misread instruments.

Experts recommend both partners in a dive team have submersible pressure and depth gauges on every dive. For dives below 100 feet, each person should have two depth gauges, one dial and one capillary type.

To safely read depth gauges always



round off the number to the next highest ten-foot increment. This provides a margin of safety for decompression.

Shallow water creates special problems for depth gauges, even those accurate to within one percent. As good as these instruments have become, the effects of salt water, temperature and parallax cause their readings to be slightly inaccurate, particularly in shallow water.

That's why many experienced divers use two depth gauges: one for descents of more than 100 feet as well as one for general diving. The primary gauge is dial type mounted in a combo or console for deep water and all-around use. The second is a capillary gauge fastened to the primary gauge hose. It's a simple, inexpensive unit for shallow water and decompression, thus an intelligent addition to any depth/pressure system.

A diving instrument system begins with a submersible pressure/depth gauge combo. When building a system, a compass is the most valuable addition. In a console a compass is automatically part

of a three-instrument system like the ones made by Dacor, Farallon, Ocean Dynamics, Scubapro, Seapro, Sub-Aquatic Systems or U.S. Divers. Or it can be purchased separately and added on, (see sidebar). How a compass is mounted is a matter of individual preference, subject to experimentation and change. While it is fine to experiment with compass location it should never become an optional piece of underwater equipment.

Assuming the evolution in diving instruments and your own good sense have convinced you of the wisdom in good underwater information, some decisions are necessary before you do a Visa quickdraw in your local dive store.

Take a few minutes and think about where you dive most. What are the prevailing conditions? Next figure out just what your bankroll will support. A safe bet is to expect to spend between \$90 and \$190 for an instrument system. The features you select should be determined by diving activities, locations, water conditions and cost.

Top-of-the line depth/pressure gauges which have been designed to attach to your diving watch are pictured on the opposite page. From top: Sea Quest, Parkway Fabricators, Sherwood and Selpac. Above, clockwise from top, basic depth/pressure gauges: Farallon/Oceanic, Tekna, Dacor, Water Lung (formerly Sportsways) and Scubapro.

Combos, consoles and individual instrument cases are made of various materials; the most common are hard plastic and softer, shock-absorbing rubber-like housings. Under normal use either one is a winner. Some divers say hard plastic will shatter upon violent impact. They prefer softer, more absorbent cases. It appears a moot point since a shot with enough force to break a hard plastic case would no doubt destroy an instrument housed in something softer.

Since material isn't all that important, a combo or console's shape is a better factor to consider. Dacor, Ocean Dynamics and Tekna make consoles with in-



Custom Consoles and Combos

FOR THOSE WHO FEEL they aren't enjoying the full diving experience unless they've a hand at building their equipment, the following is a list of manufacturers who make console shells for instruments. Many major gauge manufacturers supply the necessary works to complete the customized console or combo of your choice.

Aqua-Craft Inc.
7992 Miramar Road
San Diego, CA 92126

Global Manufacturing Corp.
1675 South 43rd Street
Milwaukee, WI 53214

Pennform Plastic Products, Inc.
365 Mulberry
Wyandotte, MI 48192

dentations or grooves for a better grip. Some instrument housings angle the gauges, making them a bit easier to read. Others are deeply recessed to prevent scratching, even though most scratches aren't noticeable underwater. Basic black is common for combos and consoles, though some are available in blue, orange or yellow. The point is to look at them all, handle them, imagine how they'll be used and then buy the one that feels and looks best to you.

As America converts to the metric system, more diving instruments will incorporate both systems. It will be confusing until American divers are familiar with the metric system. If you want to begin learning, or are planning a dive vacation to Europe, consider a dual-gradiation system. If you buy one, make sure your diving buddy can read the instruments.

A gauge's calibration is important for legibility. This particularly applies to depth gauges. Since most recreational diving takes place from 20 to 60 feet, with prudent divers never exceeding 100

Black is passe—bright colors and shapes catch the eye when selecting a color-coded pressure/depth/compass instrument system. A small sampling of the models available are pictured above. From left, Seapro, U.S. Divers and Sub-Aquatic Systems' versions.

to 130 feet, there is little reason for a depth gauge to indicate more than 150 feet. The result is the most frequently read part of a depth gauge's face are those increments indicating the 10- to 40-foot marks. Special gauges for divers who often dive deeper are calibrated to 250 feet. They are not as accurate as those for lesser depth and are harder to read. Depth gauges with needles that go around more than once are difficult to read in poor light.

Another depth gauge consideration is the position of zero. Half the gauges reviewed by *Sport Diver* have zero at the bottom of the dial, approximately in the six o'clock position. The rest place zero at nine o'clock. Which style is better is a matter of preference, though the six

o'clock position appears to be a more familiar reference point for some divers.

Other depth gauge considerations are more specific. For example, divers at Lake Tahoe and other high altitude lakes prefer gauges with altitude adjustments, a feature unnecessary at sea level.

Deep-water divers should consider gauges with maximum depth indicators which, when added to a bottom timer, will decrease the possibility of forgetting to record depth and time. Experts recommend these items and, of course, a decompression table for anyone planning a deep dive.

Combo or Console?

After selecting the gauges for your intended use, you should consider their arrangement in a combo or console. As always, the system starts with the pressure gauge. It must be located at the end of the high-pressure hose coming from the regulator, since the hose must connect directly to this gauge. If a capillary gauge is attached, it goes on the hose below the main pressure gauge.

There are several ways of mounting a two-unit combo. The depth gauge can face forward, in line with the pressure gauge, or back-to-back in a compact two-instrument cluster. When three gauges are to be used in a console there also can be several choices. The third gauge is usually a compass and it can be mounted back-to-back with the depth gauge. Or it can be in line with all three gauges facing in the same direction, a set up less compact than back-to-back, though a little easier to read. Again, it's strictly a matter of choice.

When your combo or console is arranged it's time to decide how to fasten it to your other equipment. The high-pressure hose will keep it from coming loose, but most divers prefer an additional measure of security, to keep the instrument cluster from hitting hard objects. Various loops, lanyards and ties are sold at local dive stores. Once again, it's a matter of preference. All of these items are inexpensive so you can apply some trial and error testing.

Regardless of how you lash your combo or console to your body, you must work with a few given factors. Most diving instructors suggest instruments be on a person's left, simply because the hose comes from the left side of the regulator and it makes a neater, more direct connection to the instrument cluster. Then the combo or console can be attached by a strap or lanyard to

the buoyancy control system, backpack or tank. It should *never* be attached to your weight belt.

You have decided which instruments best apply to your diving area and, have mounted them in a combo or console. Now it's time for some hands-on use. Attach the regulator and instruments to a tank and slowly turn on the air. If you allow air to rush from the tank there's a great possibility of damaging the pressure gauge. Be sure the pressure gauge face is turned away from those in the area; it's unlikely a gauge face would blow out, but if it did, this simple bit of caution would prevent injury.

Divers planning high-altitude freshwater descents will need to make depth gauge corrections since all instruments come from the manufacturer set for salt water diving at sea level. If you choose a gauge with an altitude adjustment then it's no problem. Or if you have added a capillary gauge to your system you'll find it more accurate at altitude than a dial type. However, if you don't have an altitude adjustment or a capillary gauge, a conversion table will be needed for altitude diving.

Gauge Care

Instruments, like all equipment, require care when a day (or night) of diving is completed. They should be washed thoroughly in warm, fresh water.

If you can avoid exposing diving instruments to temperature extremes, direct sunlight, rough handling, chemicals and lubricants, they'll last longer. Store gauges in a cool, dry and dark place, protected from being crushed. Traveling divers pack instruments in a carrying case or wrap them in a wetsuit to reduce the chance of damage.

Gauges must be serviced regularly, usually on an annual basis along with your regulator. Local dive stores can check gauges for variation and can recommend replacement if needed. Any time water seeps into a gauge it should be serviced — immediately.

Newer submersible pressure gauges come with safety blow-out discs, a type of pressure relief plug. Each manufacturer supplies an instruction sheet showing divers how to check the discs before each dive. It's a good thing to do as the discs are there for diver safety and should never be tampered with, just checked to make sure they're in place. Any missing discs must be replaced before the gauge will function.

Though diving instruments have

If It's Red It Must Be Deep

ONE OF THE MOST important factors in building an instrument system is gauge legibility. Most of today's submersible pressure gauges read to at least 3500 psi, necessary to provide a margin for 3000-psi tanks. All the units here are either 4000- or 5000-psi gauges.

To make these instruments easy to read some manufacturers color-code them, usually red or blue, so they can be read at a glance. Depth gauges are also being color-coded and some pressure/depth gauge combinations are coded together. The following is a typical matched color coded combo:

Color	Depth in Feet	PSI
white	—	0 to 500
blue	0 to 40	500 to 750
yellow	40 to 100	750 to 1000
red	100 to 150	1000 to 1250

With a set of color-coded instruments divers can quickly calculate air reserve/depth relationships and the exact time they must end a dive. New-style color coding is offered by Dacor, Ocean Dynamics, Parkway, Seapro, Seaquest, Sub Aquatic Systems and Water Lung (formerly, Sportsways).

come a long way, they are still being improved through technology and manufacturer innovation. One of the more significant improvements is a change in regulator high-pressure hose fittings. Some older pressure gauges will not fit newer regulators and vice versa, making it difficult to connect a low-pressure fitting and thereby exploding the hose. Divers with a mix of new and old equipment can buy adapters, good for equipment upgrading.

Today's diving instruments are "state of the art." But that doesn't mean the evolution is over; far from it as manufacturers experiment with integrated capillary depth gauges, digital readouts, bigger consoles (some with built-in slates) and other features they aren't even talking about. It's all coming. Even though the diving instrument future is bright, don't wait to upgrade your gauges. ☺

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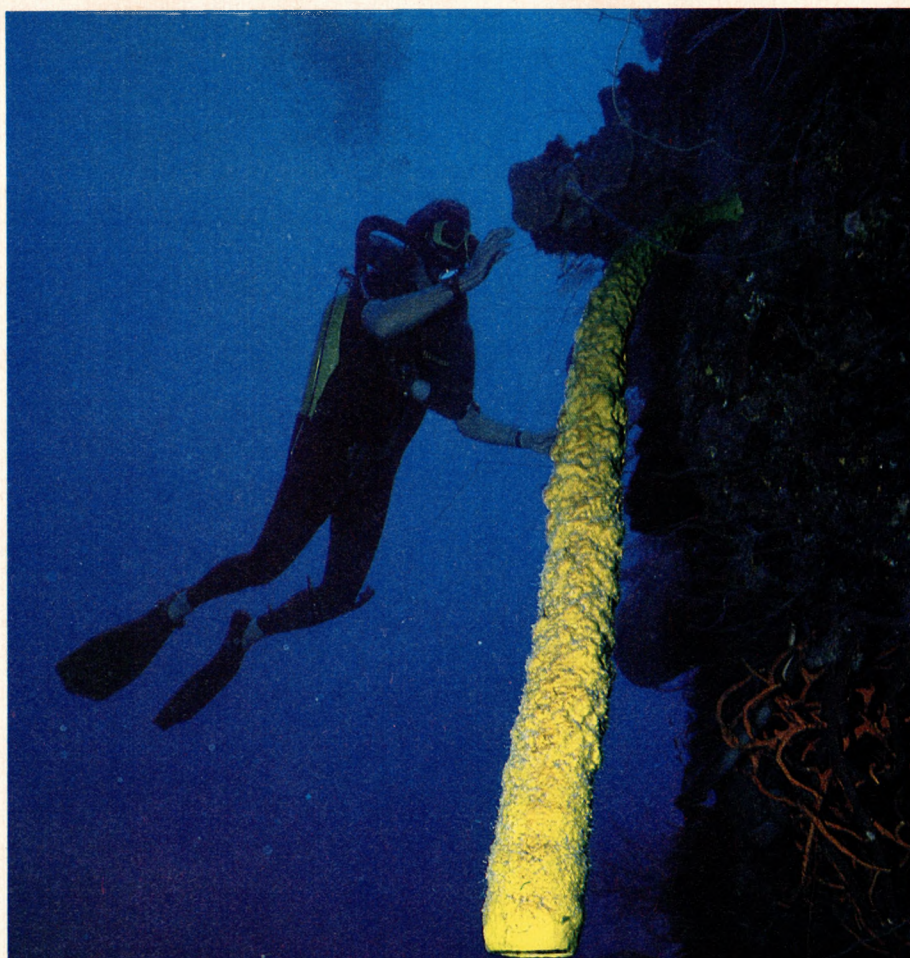


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Farming Kelp

Kelp helps make beer bubbles last and it smooths chocolate-chip double-dip sundaes. But kelp also coats paper, makes fabric flame-retardant and, if all goes well, may help ease the energy crunch.

BY VIC COX



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Imagine diving through sun-dappled forests of giant kelp, the Pacific's answer to the proud coastal redwood. Swaying in the current with the grace of a ballroom debutante, bladder-buoyed fronds of flat, rubbery blades and brown stalks reach to you. Blue-green shadows play catch with light rays scattered by the living canopy overhead.

All around you is life. A kelp snail grazes on a gas-filled float as a magenta nudibranch inches across a blade. Yellow kelp crabs climb a handy stipe, the plant's stalk. Purple and red sea urchins happily munch on pieces of decaying *Macrocystis pyrifera*, the chief species of giant kelp found offshore of Southern California and along some of its islands.

Schools of fish, some feeding on kelp shoots, others grazing on the grazers, are common in this realm. Individual residents, such as kelp bass and tree fish, sport colors and patterns blending with the surroundings. Diminishing air pressure cuts short your exploration and sends you regretfully back to the surface world. Leaving the kelp kingdom you've a wistful feeling akin to a tourist's return from a distant land: a wonderful visit, but the nine-to-five grind will soon render the experience remote and unreal.

Do not despair. A bit of knowledge can go a long way toward understanding more about these unusual marine "trees" and the role they play in everyday life.

Seaweeds are marine algae. They supply people in many nations with food, livestock feed, fertilizer for crops and, in its processing, a variety of chemicals important to products manufactured in many modern industries. And if an experimental "farm" anchored off the California coast proves successful, giant kelp may become a vital new source of renewable natural gas.

Records dating from 17th century Europe show how seaweeds were burned for the soda and potassium salt deposits left in the ashes. These ashes were called kelp, but, today, kelp refers to brown algal seaweeds such as *Macrocystis*, *Nereocystis* (bull kelp), *Egregia* (feather kelp), and *Pelagophycus* (elk kelp). Asians have included seaweeds in their diet long before the time of Christ although not all were from the kelp family.

After nearly dying out, the large

Vic Cox is a Southern California-based freelance writer and photographer who admits to liking whales, kelp and West Coast diving.



BOB EVANS

Like some great water-borne tractor, a barge harvests the burgeoning seaweed. Should the Test Farm prove feasible, kelp may be the major source of fuel-grade alcohol by 2000 A.D.

brown algae again dominate the Pacific kelp beds from British Columbia to northern Baja California. Medium-sized brown algae, such as *Laminaria*, is an important industry along Canada's eastern seaboard.

In California, the giant kelp's chemical composition and amazing growth ability make it the foundation of an industry grossing more than \$10 million a year from mowing offshore kelp beds. San Diego-based Kelco Corporation, the world's largest kelp processor, accounted for most of the 170,000 tons of weed gathered in 1979, according to California's Fish and Game Department.

A six-ship fleet of self-propelled barges cuts swaths 20 feet wide and up to four feet deep through the beds. This leaves plenty of regenerative material for an alga which sprouts between one and two feet a day — one of the fastest growth rates of any plant on earth. Like most brown algae, giant kelp is more than 85 percent water; hundreds of tons of wet kelp gathered by these mower barges must be squeezed, chopped and chemically processed at onshore rendering facilities to extract the contents.

The prize sought is alginic acid, 13 to 40 percent of brown algae's dry weight. A complicated procedure extracts algin, which in granular or fibrous powder form is known as alginate. These compounds are so versatile they thicken,

smooth, emulsify, stabilize, gelatinize or create a film when combined with other substances. And they are nontoxic.

Hence, many brewers use alginates to form tougher beer bubbles, making for a longer-lasting foam head. Alginates keep cosmetic creams from separating and help maintain ice cream's smoothness. Part of the taste and texture of chocolate milk drinks and glazed doughnuts are derived from alginates. They do everything from coating paper to improve its printing quality to making it greaseproof.

As if those weren't enough uses, it impregnates fabrics to help retard burning. Other forms are used in laundry starches and textile print pastes. Some pharmaceuticals contain algin, as do certain adhesives, rubber products, wall-board cements and auto polishes.

Surprisingly little information is available describing what alginic acid does for kelp. What is known suggests algin makes a major contribution to kelp's seaborne existence.

The acid found in cell walls of all the larger brown algae and some of the smaller ones is not uniformly distributed. Some kelp species have more alginic acid in the blades than the stipes; in others it's vice versa. Researchers have discovered that the time of year, nutrients in the water and geographical location all influence the content. Northern California giant kelp seems to contain less acid than its counterparts in Southern California.

Unlike most land plants, kelp have no root system for anchorage or food gathering. Instead they absorb nutrients

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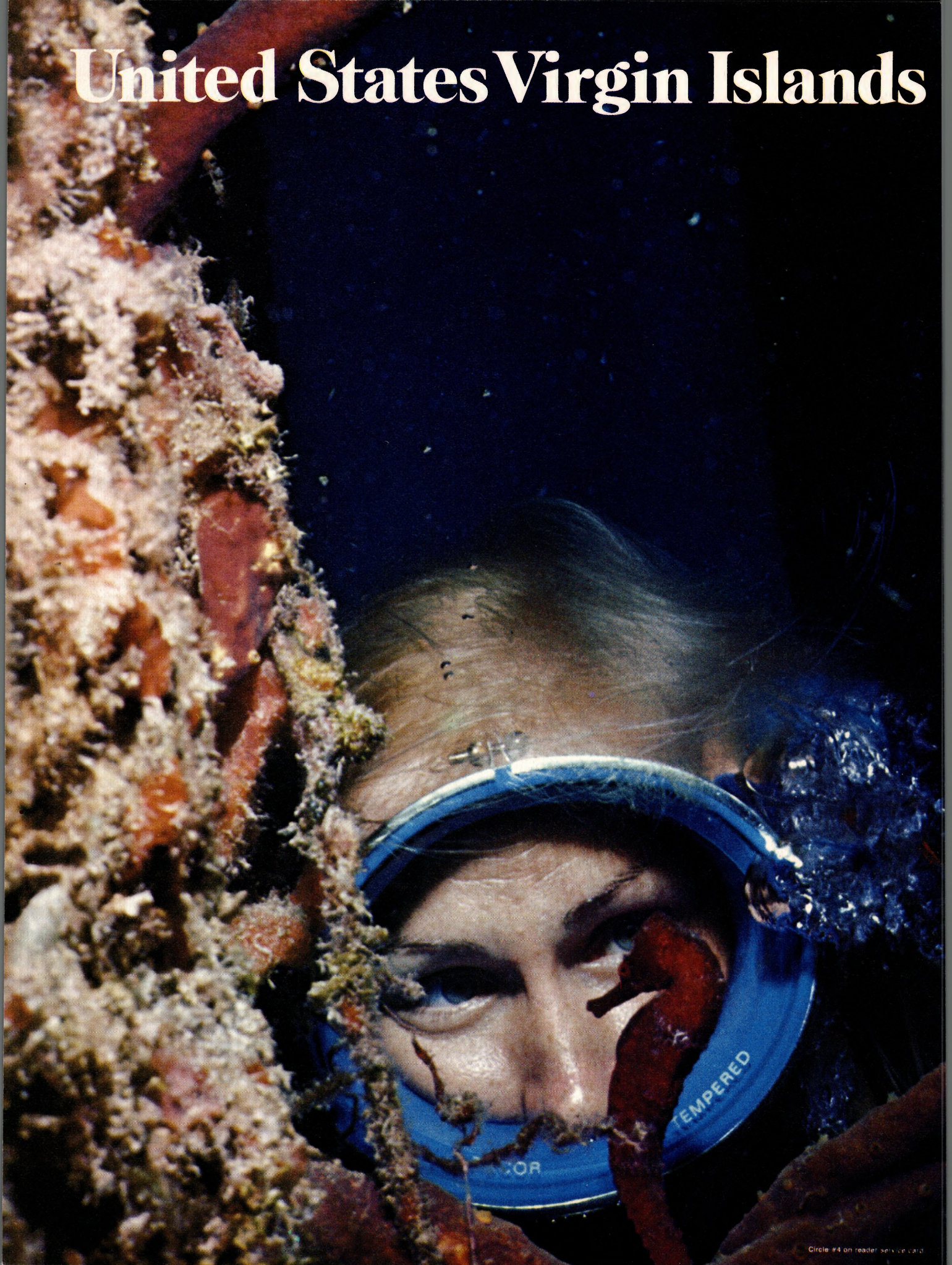
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SEA TECHNOLOGY *continued*

throughout the whole supple structure: blades, stipe and holdfast. Their feeding efficiency is illustrated by their once being the principal source for commercial iodine. Existing in extremely minute quantities in seawater, iodine is found in brown algae in concentrations 200,000 times that of the surrounding ocean.

Besides absorbing food the holdfast, a tangle of tough, fibrous strands at the

Giant kelp canopies are so thick most of the year that 99 percent of the sunlight cannot get through.

plant's base, attaches kelp to rocky outcroppings or any firm surface. This form of algae cannot develop on mud or sand bottoms except in very calm water.

Alginic acid seems to provide kelp cells with strength and the resilience to withstand normal tugging of currents and swells. Any diver who has been entangled by mature fronds knows kelp stipes do not yield easily when pulled; they have to be bent to be broken. Smart divers avoid the thickened columns of kelp in mid-water and seek passage near the bottom.

Elasticity is one key to giant kelp's endurance, another is its rapid growth rate. Under benevolent conditions (plenty of nourishment, low water temperature and spared invasion by hordes of its natural enemy, the sea urchin) *Macrocystis* will flourish. It grows ten to 15 feet within the first six months of life and can stretch 200 feet from stipe tip to holdfast. It is at the end of the stalk that the business of growing takes place.

Each new blade is equipped with a gas-filled float. Together these golden balloons lift the frond's tip to the surface where horizontal spreading weaves the kelp forest's familiar canopy. Dr. Wheeler North, professor of environmental science at the California Institute of Technology, estimates 50 to 60 percent of the adult plant's bulk is in the top ten feet of the frond. This is where most photosynthesis occurs; the resulting building blocks are carried down the stipe to sections in the dark.

Bull and giant kelp canopies are so thick most of the year that nearly 99 percent of the sunlight cannot get through; few other large marine plants are found

under mature kelp beds. However, internal circulation of kelp is so efficient it promotes a rapid turnover of cellular tissue. Dr. North says giant kelp fronds' individual blades may last only a month or two before deteriorating. The lifespan of the whole frond is usually no more than six months.

Giant kelp forests may endure for only a few years, barring high winds or sea urchin attack. Bull kelp, which have feather duster-like blades fastened to a baseball-size float, are routinely ripped out each winter by storms.

There is a big advantage to rapid replacement of kelp parts: encrusting organisms love the plant's dark crevices and would otherwise weigh down the floats, sinking the fronds and destroying the forest. According to one scientist, an average bed of giant kelp provides 14 times the encrusting surface available on the bottom alone. To the billions of animal larvae wandering through coastal upper waters, such protection means survival, or at least a brief respite from a predator's stomach.

When *Macrocystis* goes to seed it doesn't mess around. Throughout the year special "fruiting" blades covered with spore-producing cells release millions of potential giant kelp into the current. Propelled by two tiny tails the spores, which usually travel no farther than a few hundred feet, attach to the bottom and develop into microscopic male and female plants. Then their sperm and eggs cells combine to produce an embryo.

Under laboratory conditions, Dr. North says, the survival rate for the embryo has improved — to one in 100,000, which shows how rough life is for a juvenile kelp plant.

In the last two or three years Dr. North has collaborated on a government- and industry-financed experiment: controlled raising of giant kelp in the ocean for natural gas production. *Macrocystis* grows year-round, although at different rates. A natural bed can be harvested a minimum of two to four times annually. Dr. North and his technical co-workers from General Electric and Global Marine Development reasoned if kelp were on a submerged structure constantly showered with nutrient-rich cold water, a sustained maximum growth might permit six or more harvests a year. This is what engineers are shooting for at the tenth of an acre site five miles off Laguna Beach, California.

continued

The Caymans

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Paul Tzimoulis, Editor, Skin Diver Magazine

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The Test Farm, as it's been dubbed, resembles the ribs and shaft of an umbrella moored upside down in deep water. Three diesel engines pump 9000 gallons of water a minute up a weighted, 1500-foot long intake pipe and over the adult fronds tied to the farm's steel skeleton. While problems bedevil the project—the biggest is how to prevent plant entanglement with the structure during storm swells—its chief engineer is confident they can be overcome.

Emphasizing that the farm is "just a biological lab," GE Technical Director Armond Bryce says he expects answers to key questions on kelp productivity by the end of 1983. Encouraging results are surfacing already from the methane end of the operation.

The use of anaerobic bacteria to digest chopped up giant kelp has produced twice the amount of methane generated by a similar quantity of "the best municipal sewage," Bryce says. He is certain of boosting that yield and shortening digestion time with procedural changes and other species of gas-making bacteria.

If the Test Farm proves feasible, a larger farm will test the economic realities of methane production from brown algae. Proponents of kelp to gas conversion foresee future commercial farms of 100,000 acres. It has been estimated a farm this size could supply enough natural gas for all the present consumers in Southern California's 12 counties for two months.

Beyond methane, the digestion process also produces alcohols, which could help expand gasoline supplies, and a nitrogen-rich sludge that would be a valuable fertilizer. More research may turn up other important by-products.

No one seems too concerned about the environmental impact of vast new kelp beds and the artificial surge needed to create and maintain them. That may be because the initial evidence hints of positive effects: more shelter and plant-supplied food breed more sea creatures, many of which humans eat. And larger farms will require wave-powered pumps for economic reasons. "We must use wave-power pumps to get a 60 to 70 percent efficiency rate and bearable costs," Bryce says.

Kelp looks to play an even larger role in modern American life. So, you can take the diver out of the kelp forest, but keeping kelp away from the diver—or down on the Test Farm—is increasingly unlikely.

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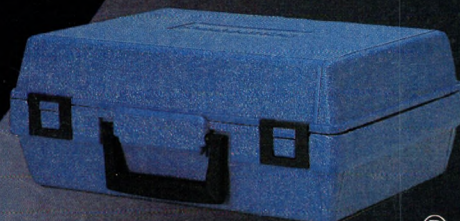
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I LEARNED ABOUT DIVING FROM THAT

Plan your travel, travel your plan.

BY NORMAN B. HAMILTON

AS I PAID \$43 for excess baggage, I realized what started as a vacation was turning into a lesson I would never forget.

The experience happened five years ago when, as a newly certified diver, I wanted a diving vacation. Looking through magazine ads, I picked a destination which promised accommodations, meals, diving and chartered air service from Ft. Lauderdale. I chose a five-day package. When I called the phone number in the ad, the person on the other end was more than helpful in making my reservations but could not answer any of my questions about the diving or available equipment.

I booked accommodations but not my flight to Ft. Lauderdale. When I finally called the airline a week before departure, I was told all flights were booked but I could fly stand-by. Not a good way to start a trip. Things would get worse.

On the day of my departure, I was ready and anxious. My dive equipment was packed in a new gear bag, the two camera equipment cases were securely packed and one suitcase full of clothes brought the total bags to four. Arriving at the airport one hour before departure, I handed my ticket to the clerk and he told me to wait with the rest of the stand-bys. I missed the flight, but was promised a seat on the next plane. The second plane was scheduled to arrive only 45 minutes before the charter plane was to leave for the island. On the flight to Ft. Lauderdale, I kept wondering if the connecting flight could be made.

My baggage was the last to arrive but I still had 30 minutes to make my connection. As I stepped up to the counter I read a sign that made my heart sink: "All passengers must have proof of citizenship and only 44 pounds of baggage allowed per passenger." Besides not having a passport, I knew I was more than a

little overweight. A voter's registration card cleaned up my problems — so I thought.

The small island airport was a noisy mess of taxi cab drivers, relatives, sightseers and hustlers. After clearing immigration, I waited for my bags. After 30 minutes I inquired about my missing luggage. I was informed that even though I had paid overweight charges, I

*The rest of the
five days were enough
to turn me
against diving travel
forever.*

was not at the Ft. Lauderdale Airport an hour in advance and my bags would not arrive until tomorrow.

No hotel representative was at the airport so I decided to take a taxi. Imagine my surprise when I learned the fare was \$27. No airport transfers had been included in the package so I had no other choice but a cab.

Arriving at the resort, I had another costly surprise waiting. When I had booked my dive package, the reservationist neglected to tell me the price she quoted was for double occupancy. Since I was traveling alone I had to pay more money for my package or share. Reluctantly, I chose the latter.

By the time I got to my room and unpacked, I was ready for a drink. Forget about a free "welcome drink," that wasn't included in the package. As I sipped the first of many piña coladas, the afternoon dive group returned. Watching the divers, I tried to guess my new roommate. The only person who seemed alone was a skinny man with glasses wearing wet jeans and T-shirt with a safety vest around his neck.

Entering the room, I found my new roommate sprawled on my bed in a wet

bathing suit. After introducing myself, I inquired about rental gear. My new friend said if I hurried to the dive shop I might find something to rent. Another extra charge.

The rest of the five days were enough to turn me off diving travel forever. My equipment didn't arrive for two days, the rental gear consisted of a safety vest, skindiving fins, a leaky, old mask and a regulator with no pressure gauge. I felt upset when told I had to make a shallow checkout dive. I became furious when I learned the package included only one boat dive per day.

On top of that, after my roommate checked out, my room rate went up. However, the biggest surprise was when I checked out and received my bill. The five-day package had been \$389. Due to extra charges for meals, gear rental and increased room rate, the final bill was close to \$700.

When I arrived home, I threw my gear into the closet, and swore never to take a dive trip again. What started as a relaxing vacation turned into one of the most expensive hassles of my life.

As I said earlier, this happened five years ago. Since then I have taken eight more trips without the slightest problem. Now I use professional scuba tour operators.

Attending a local diving slide show, I met a representative from a tour operator who explained how easy it was to have a hassle-free vacation. Now, everything is taken care of in advance. Extra luggage is no problem as each traveling diver has an overweight allowance. Airport transfers, three meals and dives a day, a welcome drink and a night dive are included in many a package price.

As I wouldn't recommend anyone learn to dive from anyone but a professional instructor, I now recommend anyone wishing to go on a diving vacation consult one of the many professional scuba tour operators. It's the best way — if not the only way — to ensure a diving vacation to fondly remember. ☺

Norman Hamilton is Sport Diver's International Travel Sales Director.

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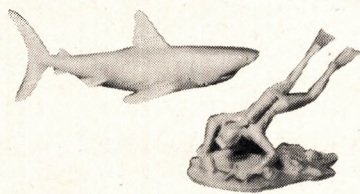
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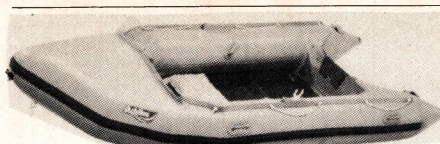
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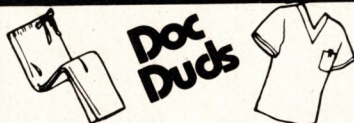
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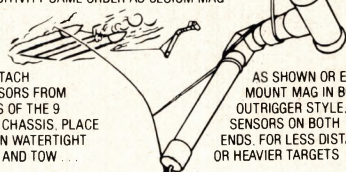
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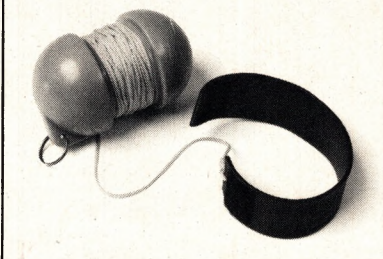
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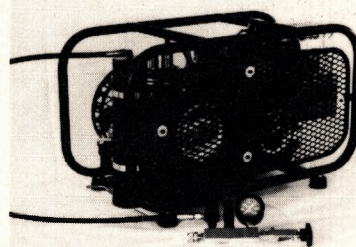
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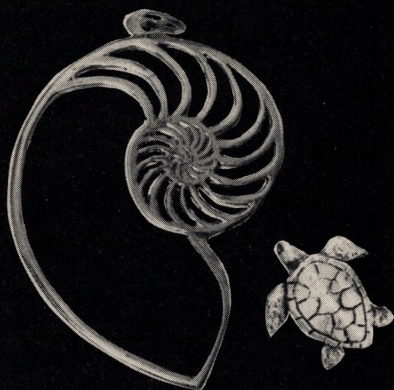
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2. Circle the numbers on the card that correspond to the key numbers at the bottom of the advertisements that interest you.

3. Simply mail the card. No postage is needed.

4. To order a subscription to SPORT DIVER at current low introductory rates, simply check the appropriate box on the card.

5. The address on the card is for our FREE INFORMATION SERVICE only. All other inquiries should be directed to *Sport Diver*, One Park Avenue, New York, N.Y. 10016.

SPORT DIVER

P.O. Box 13847
Philadelphia, Pa. 19101



FREE INFORMATION SERVICE

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SPORT DIVER
P.O. Box 13847
Philadelphia, Pa. 19101

SPORT DIVER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

1. Are you planning to buy diving equipment in the next 12 months?

a. ☐ Yes b. ☐ No

2. Are you planning to take a diving trip in the next 12 months? c. ☐ Yes d. ☐ No

Name _____
(please print or type full name)

Address _____ Apt. _____

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(Full subscription price \$15.00).

SD 5/81-1

Expires October 31, 1981

SPORT DIVER

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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1. Are you planning to buy diving equipment in the next 12 months?

a. ☐ Yes b. ☐ No

2. Are you planning to take a diving trip in the next 12 months? c. ☐ Yes d. ☐ No

Name _____
(please print or type full name)

Address _____ Apt. _____

City _____ State _____ Zip _____

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SD 5/81-2

Expires October 31, 1981

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
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281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

1. Are you planning to buy diving equipment in the next 12 months?

a. ☐ Yes b. ☐ No

2. Are you planning to take a diving trip in the next 12 months? c. ☐ Yes d. ☐ No

Name _____
(please print or type full name)

Address _____ Apt. _____

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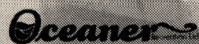
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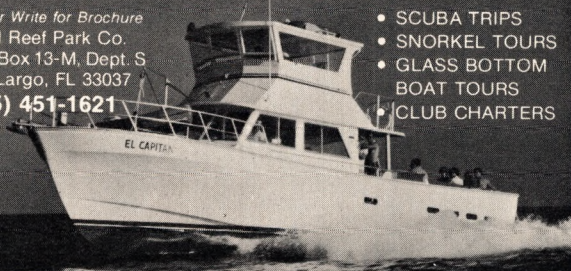
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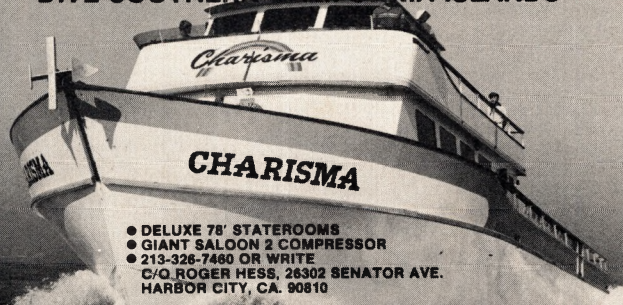
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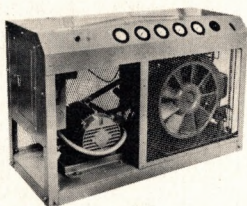
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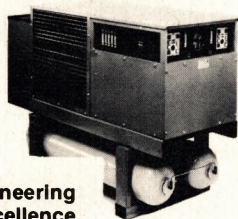
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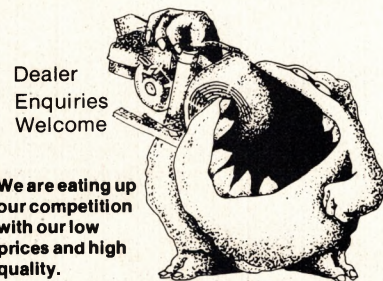
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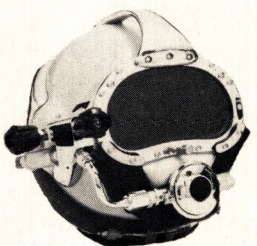
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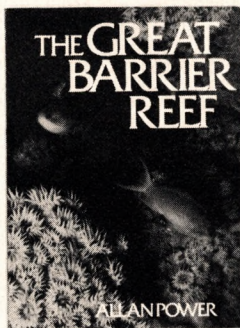
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The Great Barrier Reef

Allan Power; Summit Books, 176 South Creek Road, Dee Why West, Australia 2099; Soft-bound; 144 pages; Price: NA.

Boarding a 747 and heading south-south-west from the Sea of Cortez for close to 20 hours, you would eventually reach the Down Under Continent. Heading directly north from a Sydney touchdown, you travel by bus or jeep to an awaiting dive boat which whisks you off to that land of underwater lands. Scrambling into your dive gear you anxiously await anchorage. Then, at last, you climb over the stern, land on the dive platform and make last-minute adjustments. In a couple of minutes you will feel the tepid water coursing over your body and as you equalize, your eyes will adjust to the profusion of color around you. Then you will know that your whirlwind of transport and split-second connections was worth it. You are about to experience the Great Barrier Reef, 1200 miles of one of the world's greatest natural wonders.

For those unable to drop everything or who are not financially capable of swinging the trek, you've a chance to glimpse one-hundredth of the flora and fauna of this area by leafing through *The Great Barrier Reef*.

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Power chooses to concentrate the the text on behavior patterns of the fish, turtles, sharks, mollusks, sea stars and corals of the inhabitants of the world's longest reef. Understanding the motives for their behavior, Powers says, helps us learn more about ourselves and human/animal relationships.



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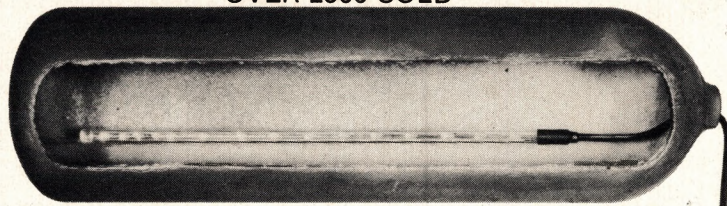


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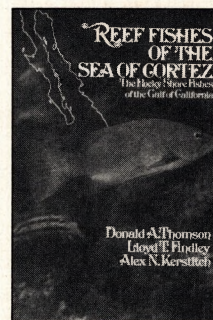
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REVIEWS *continued*

Presented in order of species complexity — sponges, polyps, marine worms and mollusks to echinoderms, tunicates and fish — the photos reveal Bavendam's kinship for the offshore inhabitants as well as an understanding of each's role in the ocean's food chain. Sea stars feed on urchins, jellyfish capture comb jellies and flounders change coloration to avoid predators. A brief introduction opens each section, but the photos carry the book.



**Reef Fishes of the Sea of Cortez:
The Rocky-Shore Fishes
of the Gulf of California**

Donald Thomson, Lloyd Findley & Alex Kerstitch; John Wiley & Sons, 605 Third Avenue, New York, NY 10158; Hardbound; 302 pages; \$37.50.

If you were to travel kitty-corner across North America from the Gulf of Maine, you'd eventually reach another biome subject to much the same tidal fluctuations: the Sea of Cortez. Featured in the July/August 1980 *Sport Diver*, the long arm of water between Baja California and the Mexican mainland harbors an assortment of fish and marine life, which like its northeastern counterpart, are endemic to that region. An endless variety of fish and sea creatures dwell there, but only the fish are catalogued in this text-like book. More than 272 resident species are described, including 45 transients which are found in the Sea but don't live there. This is a scholarly, detailed fish book and the authors have gone into interminable detail to record each fish, its Latin, common and Spanish names, distinguishing characteristics, distribution, ecology and related species. And it's a good thing they've provided so much detail. Any layman would be hard pressed to identify a Sea of Cortez fish from the black and white photos; they are out of focus, badly exposed and it's difficult to tell the fish from the flora.

Gawking at the color plates, though, is a much more pleasant way to pass the time, at least for the vicarious fishwatcher.

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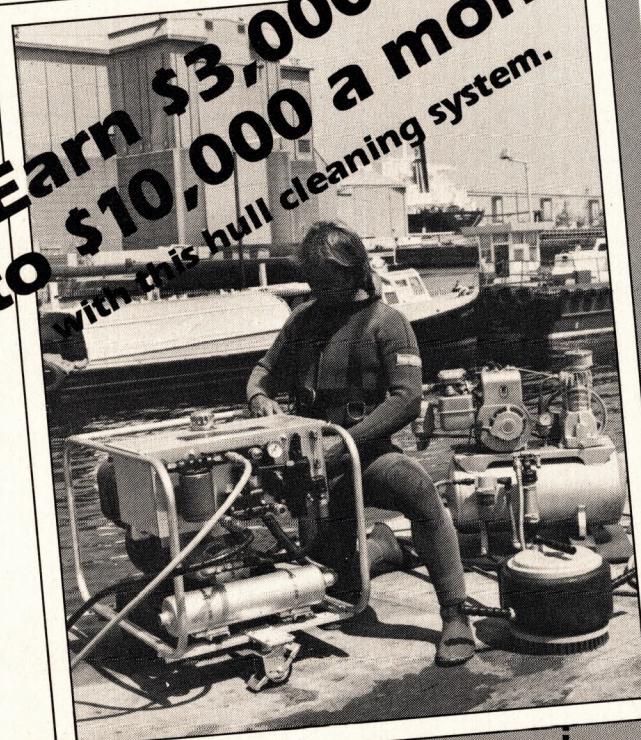
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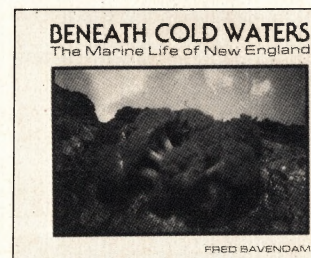
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REVIEWS *continued*

A complete, concise guide to more than 300 diving sites in and around Florida is in its up-dated third edition. The result of eight years of research, the handbook covers the best and most accessible caves, springs, reefs, wrecks and sinkholes (yes, there are numerous sinkholes in North Florida, and hard-core sport divers will dive in almost anything.) Like an aunt or uncle drawing you the route to the train station, DeLoach's maps and descriptions of the attractions of each dive area are helpful and easy to understand. Just as serviceable are the introduction to cave diving, a list of Florida recompression chambers, lobstering tips and highlights of the Florida Keys.



Beneath Cold Waters: The Marine Life of New England

Fred Bavendam; Down East Books, Box 679, Camden, ME 04843; Hardbound; 127 pages; \$18.95, plus \$2 shipping.

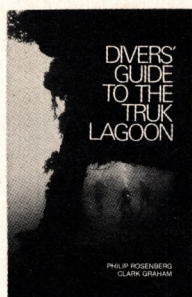
Often overlooked as a dive destination for the flourishes of bath-water warm paradises, the offshore waters of New England—especially the Gulf of Maine and the Bay of Fundy—are a marine biologist's fantasy. Covering about 36,000 square miles with an average depth of 500 feet, the gulf is a large, cold backwater of the North Atlantic. Bounded on the south by Georges Bank, a prime deep-sea fishing area, the region is sealed off from outside water circulation making it a veritable enclosed ecosystem. The surface waters of the Gulf have a counter-clockwise flow and are fed by heavy spring runoff from freshwater rivers and the daily tidal fluctuation. All these factors combine to form a community of plants and animals called a *biome*. And what a biome it is.

Though not as brilliant and popular as the marine life of the Caribbean, Pacific or Atlantic, there are many interesting and lively creatures that call it home. Gourmets, connoisseurs and those of discriminating taste may savor this area's most delectable resident, the American lobster, but for those who relish a Cousteau adventure or a tad of the exotic, take a look. For when Bavendam's artistic eye and zoologist's mind converge on a basket star, boreal squid or fan worm, it's a rare treat.

continued

REVIEWS

by Kathleen McHugh



Diver's Guide to the Truk Lagoon

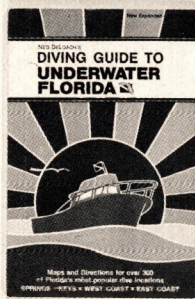
Philip Rosenberg & Clark Graham; Self-published, Box 57, Truk Lagoon, ECI 96942; Soft-bound; 72 pages; \$7.25; Second edition.

Improving a good thing is always commendable. Two instances of this recently came to my attention:

In February and April of 1944, during the height of the war in the Pacific, the U.S. Navy sunk more than 50 Imperial Japanese Navy ships in Truk Lagoon, an idyllic reef-encircled body of water holding 11 islands in the western Pacific. Thirty-seven years later, a menagerie of cruisers, transport and cargo ships, submarines and planes exist as an eerie graveyard to military might.

The shallow-water remains can be dived and many artifacts are visible, since the lagoon has been designated a marine preserve. The locations, names and descriptions of each wreck, including size, type, depth, position, heading and condition of the hull compiled from years of diving the wrecks comprise a good jump-off point for wreck freaks or dream material for the Great Santini types.

The second edition lists seven recently discovered, but yet unnamed vessels as well as additional photographs of the relics of World War II. Seventeen dive log entry pages are also included.



Diving Guide to Underwater Florida

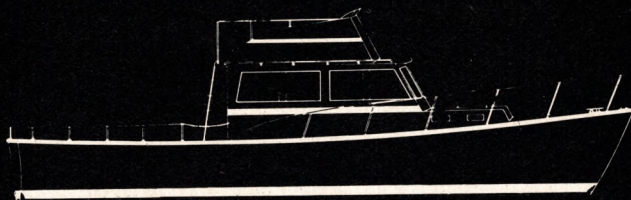
Ned DeLoach; New World Publications, 1861 Cornell Road, Jacksonville, FL 32207; Soft-bound; 176 pages; \$4.95, plus 75 cents postage; Third edition.

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WORKING DIVER *continued*

year and after a battery of interviews and physical exams, was accepted as a trainee. Mimi has been at it for just 13 weeks.

It took little time to discover mermaids have simple answers to everything. Mimi became a mermaid, "because I like to swim." But isn't it a grueling job? "Oh yes." She smiles sweetly and confides, "I jog and exercise and it still hurts. The first time I had to do the fish feed routine right after the mermaid flip routine, I nearly died."

Being a legit mermaid has its ego-boosting moments, and Mimi's parents are her biggest boosters. "My parents love it! They drag everyone down here to see me. Mom thinks it helps me lose weight." She blinks once and allows how this is as close to Hollywood's glitter as North Florida will get.

Mermaid Marti has eight years under her fins and has achieved senior mermaid status. "I enjoy performing," she explains. "There are speakers underwater and I can hear the audience applaud. The little kids love us. To them we are movie stars. We give our autographs on postcards."

Mermaid Marti seems happy in her work. After eight years of strenuous swimming, her face is without a line of worry. Like other mermaids, she has a dazzling smile and long, flowing hair. Her skin is tight, lightly tanned and glowing with health.

This all may sound sexist—this carrying on these women do—but to those who've wait-listed for acceptance to Weeki Wachee's underwater ballet, this is the *top of the heap*. This is show business and all positive ego reinforcement. "Posing for pictures and all," Marti says, "Isn't it sort of cheese-cake?"

"Well, Gloria Steinem would . . . " and she cuts me off.

"I don't believe in all that hogwash," she answers. She need not say more. Her expression flickers between anger and hurt.

As they spoke, all the mermaid mysticism unfolded and a quick glimpse of the reasons they enjoy such underwater work focused on one particular point. Unlike most professions, the mermaid's career leads to absolutely nothing—imagine *that* one tagged to a resumé. The mermaid rung is on the ladder of personal satisfaction; a ladder few individuals accept as a goal in life.

Don't you see, they explain, being a mermaid is enough in itself. It is the top of the profession.



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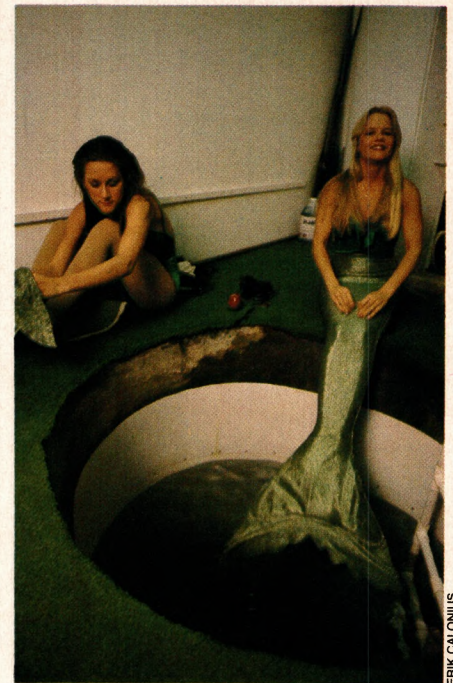
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ERIK CALONIUS

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There! There she is!"

And up glides the mermaid, doing loop-the-loops. Having let air gradually seep from her lungs for more than two minutes, she accepts the air hose from her partner. The audience loves it.

But performing is only part of a mermaid's job. Between shows, Genie's yellow pad is filled with chores to be done. Vacuuming, shower scrubbing or mending the costumes may be one of their unglorious tasks. Daily, the mermaids must be available to pose in bathing suits for tourists, and several times a week a contingent drops into the spring to clean the windows with steel wool.

A rotating shift sits in the show's control booth, a submarine-looking projectile that juts into the spring. Here they run the appropriate tapes and hit the "bubble curtain" switches on cue. And the mermaids repair the underwater equipment themselves, bleeding hydraulic lines when necessary and replacing valves and hoses.

If you get the impression they run the entire show, you couldn't be more correct. The mermaids do just about everything and pull it off without a hitch.

Mermaid Mimi, a blonde, blue-eyed senior at a nearby high school, slips into the office and slides her timecard into the punch clock. Like 900 young women from around the country, she inquired about an opening with the show last

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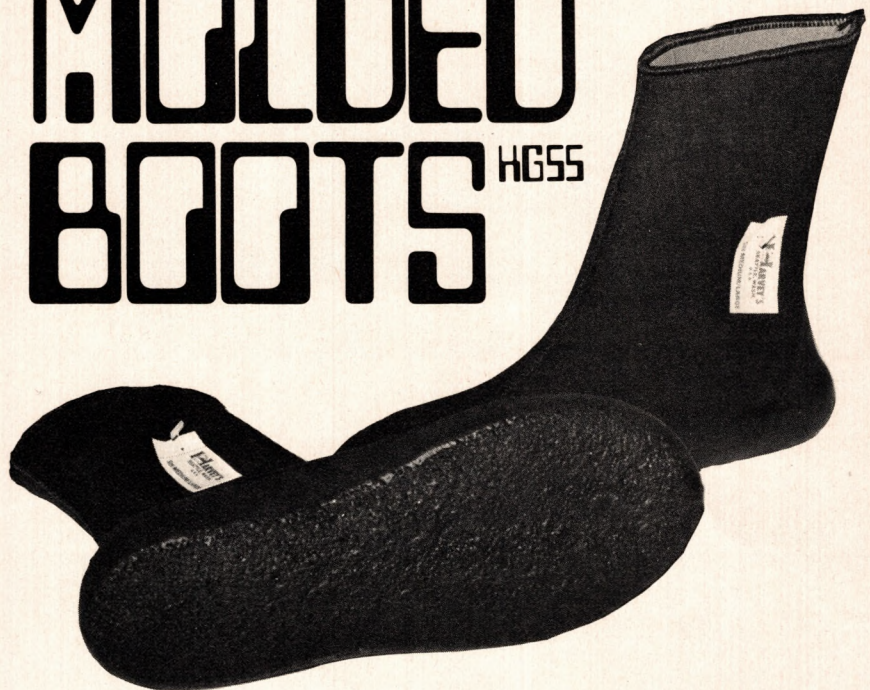
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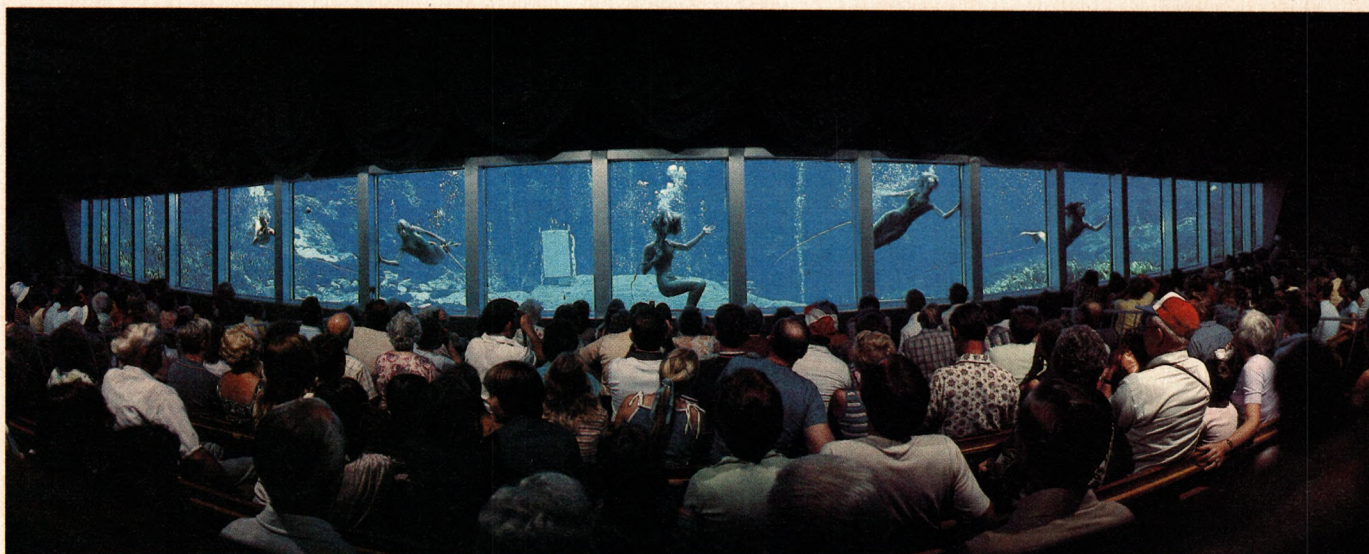
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In their element, mermaids entice and entertain throngs of tourists in the amphitheater on a fresh-water spring: the Mermaid Underwater Theater.

fishy tails and zip the heavy, green or gold fabric around them. They flop like real fish to the center of the room, where a deep shaft leading under the theater to the spring, invites them water-ward.

One mermaid gathers slices of bread to feed the fish while another grasps bottles of eight-ounce colas to chug-a-lug underwater. A third casually tucks a spare bathing suit down her cleavage.

The mermaids, still chilly from the last show, grumble about having to hit the 74-degree water again. But as the intro music swells from below, they position themselves over the narrow tube, dropping one by one, tail-first, into the water.

Within 20 seconds of the cue, all six young women plummet into the tunnel, legs bound together and lungs holding sole supplies of air. They'll be under water for another 30 minutes, breathing through rubber hoses. Tumbling into that dismal shaft even once, let alone three times a day, is unimaginable.

You would think this regimen would trim the mermaid ranks pretty regularly. Actually, the mermaids stay in the Weeki Wachee underwater show for three to five years. One worked for a decade between 1957 and 1967, quit for ten years, and now has rejoined the troupe.

Genie Young joined the mermaids in 1961 and has yet to turn in her flippers. Nearly 40, with the facial structure, smoky green eyes and coal-black hair of a true siren, Genie ranks as supervisor of

mermaids. She's Mother Superior to her fish-tailed underlings, structuring their daily activities on a yellow legal pad.

"When a girl starts out here, we assign her to a senior mermaid," Genie says in a collected voice. "The trainee follows her around like a puppy dog, watching everything she does."

*A mermaid doesn't
earn her scales until
she can dive to
117 feet and ascend
blowing bubbly kisses.*

At the outset of their underwater education the trainees are taken into the shallow river above the spring where they learn to breathe through the rubber hoses.

"It's not like a scuba regulator," says Genie, a certified diver. "The air flows at a continuous volume. It just keeps coming out, and you have to learn what to do with it." It generally takes a trainee a month to master tube breathing, learning how to stem the air flow by biting down on the tube, or by twisting a valve a few inches from the mouthpiece. Invited to try, I put a tube in my mouth and my cheeks immediately inflated to incredible proportions.

Once a mermaid has caught on to tube breathing, she must learn to adjust the amount of air in her lungs to rise, fall and hover with the rest of the group. Obviously, it wouldn't do for one mermaid to unexpectedly soar to the surface during a routine. It takes several weeks

before a trainee can adjust her buoyancy to the precision demanded in the show.

Finally, the young mermaids learn to swim in the exhausting, silver lamé fish-tails. They learn to swim without masks and to perform the routines of the underwater ballet. It takes months of grueling work to learn the act and at least a year to become proficient.

But a mermaid doesn't earn her scales until she can participate in the highlight of the underwater show:

"Ladies and gentlemen, boys and girls. The mermaid before you is about to dive 117 feet straight down to the bottom of this giant spring of spinning, rushing, turbulent water. And folks — 117 feet is equal to the height of a 12-story building.

"And there she goes! One hundred thousand gallons of water per minute are pouring up from the boil of the spring, straight into her face. You'll see from time to time she'll press her face mask. She does this to equalize growing pressure on her eardrums.

"Now you can follow her progress by watching the long air hose slip deeper and deeper. She won't stop until she reaches 117 feet, where she can wedge her body between the narrowing cliffs.

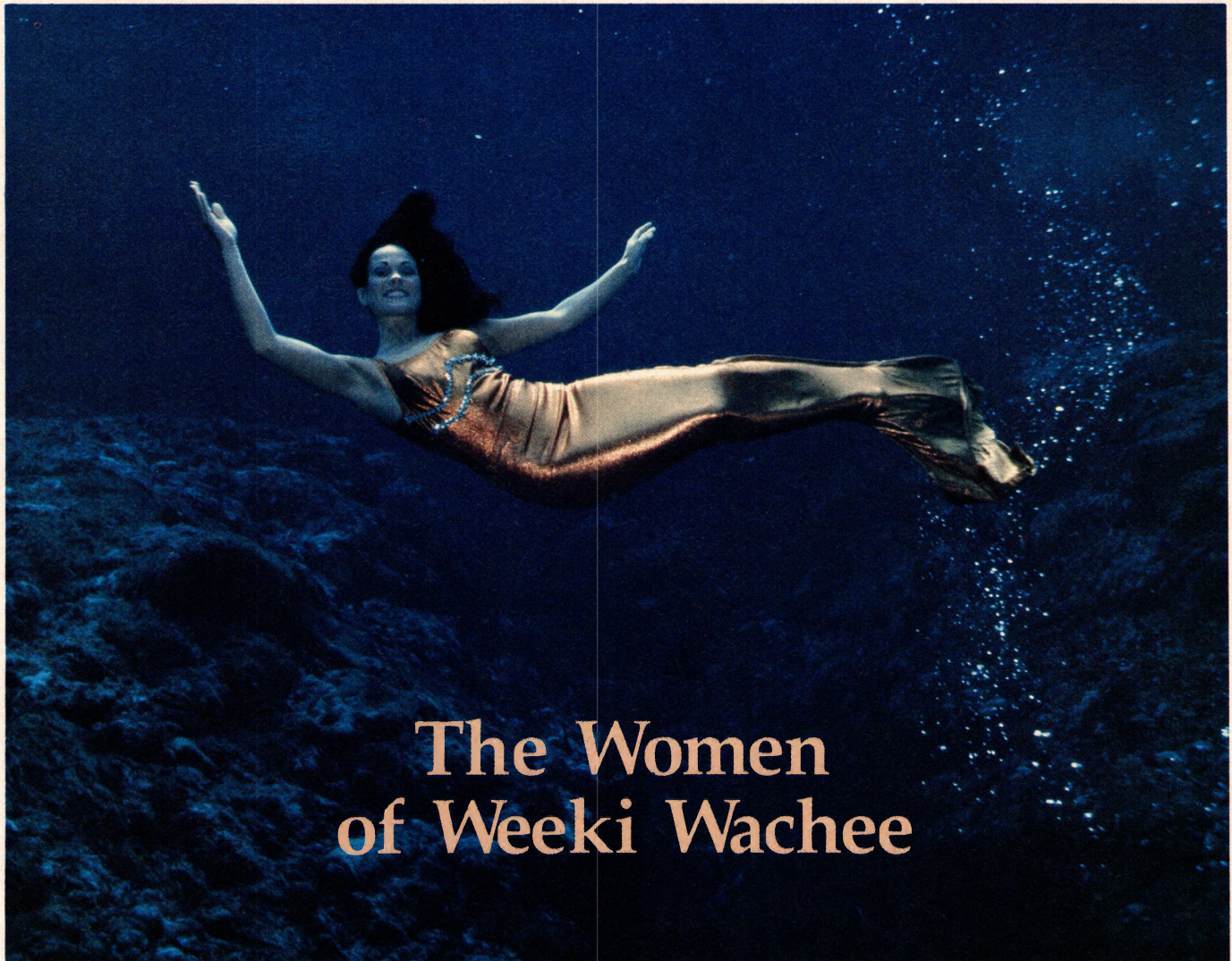
"We'll wait for the signal that she's reached the bottom—two sharp tugs on the hose. There they are! Start the clocks! Her partner is now pulling up the air hose, leaving the mermaid 117 feet down.

"We won't catch sight of her until she reaches the 62-foot level on the way up. If all is going well, that should be any second now.

"Where is she? [Music builds to a crescendo, clocks tick like heartbeats.]

continued

WORKING DIVER



SILVER SPRINGS, INC. PAT STINSON

A mermaid's life is not all seaweed and seduction. These lithe ladies may swirl and glide as if spawned, but they also run the show.

BY L. ERIK CALONIUS

SITTING IN AN UNDERGROUND theater with 300 people, you stare through a shield of glass while six mermaids cavort underwater. They soar and dip below the surface, trailing colored scarves behind them. Every now and then one grabs a rubber hose in her teeth and fills her lungs with air.

This is like no other Florida tourist attraction where fish-tailed women can be found in a natural spring. As blue-gill, mullet, freshwater bass and an occasional alligator glide by, the water ballet goes on. This is Weeki Wachee.

Fine-figured women wiggle slowly

Erik Caloniuss has worked for National Geographic and is a staff writer for the state-wide business magazine Florida Trend.

toward us, long hair streaming and fish-tails pumping. They're singing (or at least lip-syncing):

*Swishy tail, pretty face,
Lots of charm, lots of grace,
We're the gals who sunk the ships,
When they see us,
Sailors lose their grips!*

One mermaid presses herself against the glass. She smiles and blows bubbly kisses. An elderly man, who had been carried to his front-row seat 20 minutes before, totters forward and burns three rapid shots through his Instamatic. A wall of bubbles envelopes the mermaid. When it clears, the coy lady is gone.

Before the show, the mermaids gather in a small room behind the theater. They sprawl on their backs, snuggle into

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RESORT UPDATES



Red Sea

Underwater shutterbugs are invited to the Red Sea for 15 days of blissful clicking this fall. From November 15 through 30, Stephen Frink Photographic, in conjunction with La Mer Diving Seafari will depart for this Egyptian waterway aboard the 96-foot cruiser *Sun Boat*. Three to four dives per day, night dives, Ektachrome processing, and some of the world's finest diving will be featured in this 14-day trip. Contact Stephen Frink Photographic, Box 1907, Key Largo, FL 33037.

Grand Turk

Two PADI instructors are better than one — so say the staff at Underwater Research, Ltd. of Grand Turk. Having added another instructor to their crew gives aspiring divers a choice of courses: a week-long basic open-water certification trip at Grand Turk or a three-hour resort course at any of the resorts. Contact Mike Spillar, Underwater Research, Box 42, Grand Turk, Turks and Caicos Islands, BWI.



Roatan

Underwater adolescents should head for 1981 Scubacamp at the Reef House Resort in Roatan, near the world's third largest barrier reef. Students ten through 17 may enroll this summer for beginning diving, NAUI certification courses and classes in tropical and marine biology of the region. Contact Thelma Clark, 200 Ansel Rd., Geneva, OH 44041.

Tortola

Does a lanai in Tortola sound appealing? The Moorings resort on Tortola in the British Virgin Islands offers West Indian-style accommodations, sailing yachts for charter and four-day open-water diving certification year-round. Located at Road Harbour, the resort's steady 12- to 20-knot tradewinds and 70- to 86-degree Fahrenheit range make for ideal cruising conditions, while protected coves and craggy shorelines provide an array of scuba and snorkeling adventures. Contact The Moorings' booking office, Box 50059, New Orleans, LA 70150.



Galapagos

Sail back in time to an evolutionary showcase: the Galapagos Islands. See & Sea Travel will offer a 14-day program of unlimited diving and frequent land explorations on these unique volcanic outposts known for giant tortoises, marine iguanas and exotic birdlife. One third of the region's marine and terrestrial life is found nowhere else on earth. The trip aboard a 70-foot motorsailer will run from August 9 through 26. Contact See & Sea Travel Service, Inc., 680 Beach St., Suite 340, San Francisco, CA 94109.

Great Barrier Reef

The largest living thing in the world waits to be explored — Australia's Great Barrier Reef. Sobek Expeditions will offer an 11-day trip along the Ribbon Reefs near Cairns, scheduled for August or November. You may dive along the main dropoff of the outer reef in November only. Guests will stay on the *MV Auriga Bay*, Sobek's "floating resort," with all necessary dive equipment to be supplied. Contact Sobek Expeditions, Inc., Box 7007, Angels Camp, CA 95222.



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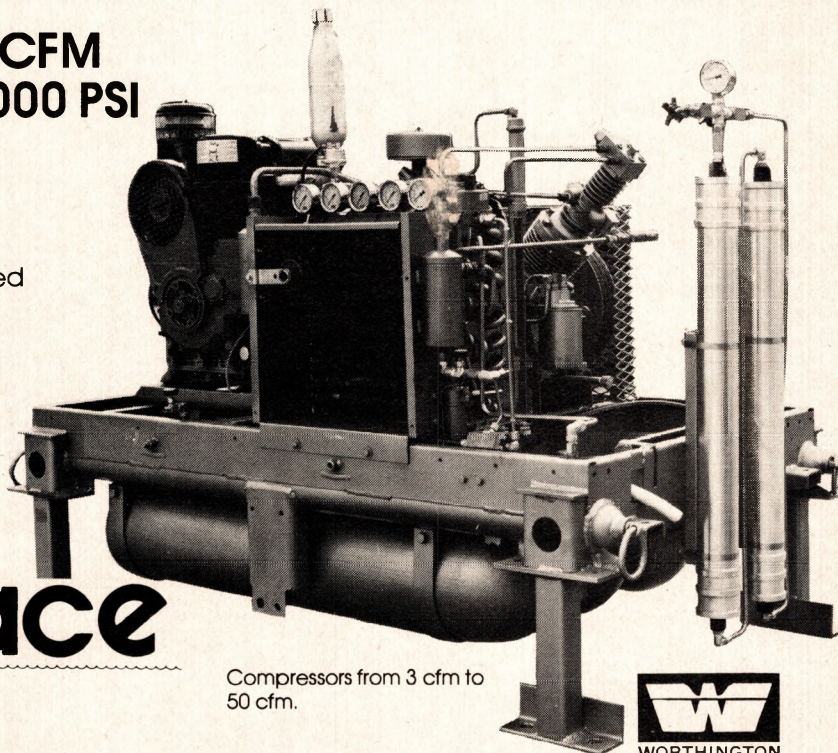
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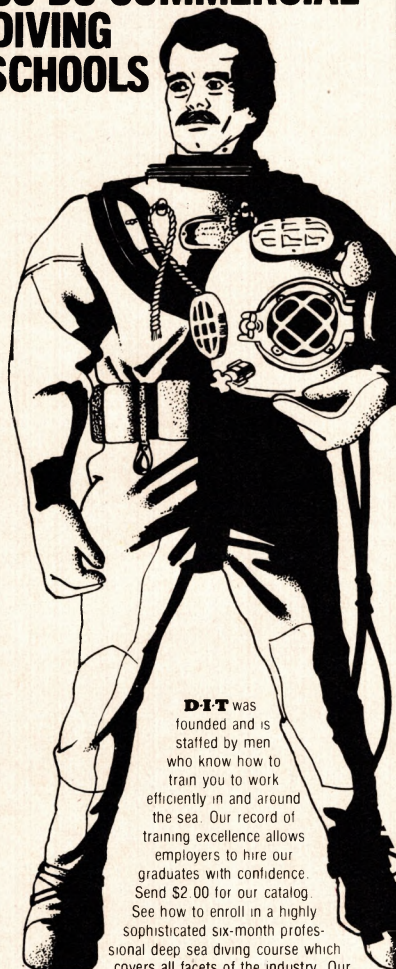
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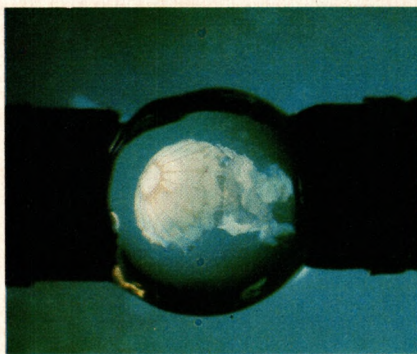
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FYI *continued*



JACK DRAFAHL

Snap, Snap. Wink, Wink.

Talk to Jack Drafa about special effects in underwater photography. He is the man who refused to spend the dollars on a fancy, imported wide-angle lens so he went out and built his own. No multicoated rare earth glass housed in a flat-black shell would do for his system. For that matter his only worry was keeping the lens *fresh*. According to Drafa, it takes only ten minutes for a red snapper's eyeball to dry out when the fish's eye lens is removed. (If you think it confusing, it's not over yet.)

To see (sic) if it could be done, Drafa mounted a fish's eye lens to two pencils, eraser to eraser, and hooked it together with a plexiglass bracket that fits over his camera's housing. Hence, a fish-eye lens.

The difficulty came not with the manufacture of his lens, but in finding the raw materials (sic, too). After much consternation and diplomacy he liberated from a local fish store enough eyes for his experiment. A few test pictures in his home aquarium and he was ready for the real underwater world. Snapp(ering) away, Drafa caught this passing jellyfish.

Good Guys Department

When 52 Americans returned from a plight no others should be subjected to, we bestowed gifts: ticker-tape parades, island vacations and, yes, even lifetime passes to Disney World.

But we were negligent with the gift-giving, say two Hawaiians, as those 52 should not be the only ones who deserve all this goodwill. There are Vietnam veterans who should receive gratitude. Duke King and Scott Cade of the Scuba Shop in Honolulu in conjunction with PADI will try to right that wrong by offering any Vietnam veteran who wishes certification, the opportunity free of charge.

"The [former] hostages have been showered with gifts, including such items as a free lifetime pass [to Disney World]," King said. "So we're offering a lifetime pass of our own, one to the underwater world."

Good on ya, Duke.

Doing it Deeper Still

They're at it again, those North Carolina university folk who insist on compressing themselves to near unfathomable depths. This time the divers at Duke—Stephen Porter, Leonard Whitlock and Eric Kramer—successfully completed a simulated dive to a depth of 686 meters or 2250 feet. As part of a 36-day experiment that focused on science rather than record-breaking, the divers completed performance tests equivalent to running one mile through mud or climbing stairs with a 30-pound load strapped to them. A special gas mixture, Trimix, developed by Test Director Dr. Peter Bennett helped improve the diver's performance under the pressures.



Proof is in the Menu

I will be first to applaud an airline that strives to improve the palatability of its food. Sadly, that improvement will not come in the way of a nine-course *cordon bleu* sitdown oyster shuck and beer swill. (Maybe that's sad, maybe it's not considering the offerings as excuses for dinners.) Nonetheless, kudos to United Airlines for its Ocean-to-Ocean service and its menus depicting exotic and well-painted shells from all over the world.

United commissioned Californian Helen de Werd to paint the seashell series that includes Glory-of-Bengal, Paper Nautilus, Carrier Shell, Alabaster Murex (pictured) and the Venus Comb. The best thing about the prints is United won't keep them to itself: Full-color 12 by 18 inch lithographs are available from Sleepeck Printing Company, Dept. A, 815 25th Ave., Bellwood, IL 60104. Six dollars will cover the cost of one print; a sawbuck will snag all five.

FOR YOUR INFORMATION by Leon Mandel Jr.

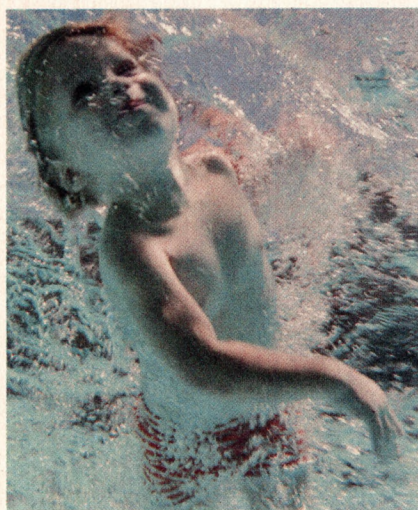
Watt Did He Say?

Secretary of Interior James G. Watt has already begun redecorating to the dismay of Republican and Democrat. Acting like a dinosaur in a Steuben glass shop, Watt's done all to promote the raping and pilaging of the earth's surface; doing so in fine fashion and in the name of making America great, again. As his first Official Act he offers for sale leases to drill for the oil and gas reserves in five areas off the coast of northern California. In a letter to the governors of California and Oregon, Watt says, "The President has instructed me to take the necessary steps to increase the domestic production of oil and gas and I firmly intend to take those steps."

Watt is not without his token environmental sentiments as he goes on to say, "I want to be sure in my own mind that we have made every effort to meet the President's request, obviously within the bounds of necessary and proper environmental protection."

This lease agreement is no revelation to the oil companies. Former Secretary of the Interior Cecil Andrus determined most of the oil and gas was concentrated in *only one* of the five basins in the area and took the four northern basins out of the lease agreement. Pursuant to his "proper environmental protection," Watt placed those areas back on the blocks.

The United States Geological Survey estimates there are a potential 982 million barrels of oil, and more than 1000 billion cubic feet of gas, beneath the seabed.



A Winner Everytime

Home movies and snapshots are often embarrassing but good record-keeping devices nonetheless. It's also wonderful when a snapshot wins its taker a jaunt for two around the world plus \$1000 spending money. That's why Dr. David Bowles and his wife, Susan, are smiling: David's love for the underwater world—and his three-year-old son, Justin—earned him first place honors in the 1980 Kodak International Newspaper Snapshot Awards competition.

"I wanted a snapshot of Justin practicing the strokes he learned in swim class," said David armed with a Nikonos III.

The diving dentist and wife will jet from San Francisco to Tokyo and Hong Kong. They'll then visit Cairo, Jerusalem and travel to several Western European cities on the return trip.

The win was no easy feat as more than 365,000 entrants competed. The fortuitous shot was entered in our photo contest but was pulled at Kodak's request after topping the other 364,999.

BC Blowup

To err and forgive are human traits, only one is considered divine. The folk at Parkway understand this and allowed they were only slightly put off our omission of their buoyancy control vest in our March/April 1981 product survey buyer's guide chart. Their independent and backmounted vest, the Cayman 1, is replete with double-bag construction, quick release and has standard CO₂ cartridges. The vest is blue with yellow and orange stripes and also boasts 44 pounds of buoyancy capacity.

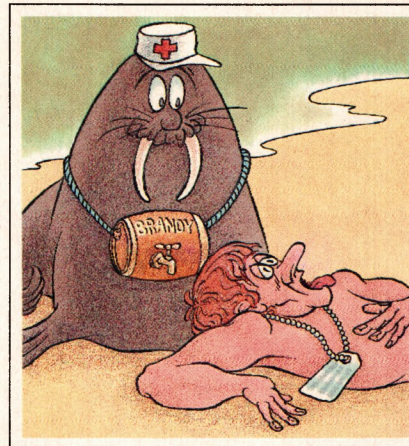
To Pinta or not to Pinta

It's happened again. Somebody cried "found wreck" and then, with little more than initial fanfare, sank to obscurity. Maybe that won't be the fate of Olin Frick and his comrade-at-dredge, John Gasque. The duo who allege to have found Christopher Columbus' *Pinta* in 30 feet of British West Indies water, were to begin salvage operations last winter. But according to the newsletter of the Turks and Caicos, *The Green Flash*, there has been no sign of Frick, his Florida-based salvage firm nor the *Pinta*.

That surprises little, according to a Grand Turk resident. "You think they're gonna find that *Pinta*?" he said with a half-grin. "Hell no. At least not in the 7800 feet of water in which she lies."

This is probably not the last we'll hear of Frick and Company.

UPDATE: As *Sport Diver* went to press we learned Frick *et al* were indeed busy salvaging vessels. The boats, however, are not 15th century Spanish galleons, but part of the Freedom Flotilla that dumped Cuban refugees on Florida shores. While the boats were sitting in Key West Harbor, they sunk and Frick was commissioned to raise them.



Tag That Diver

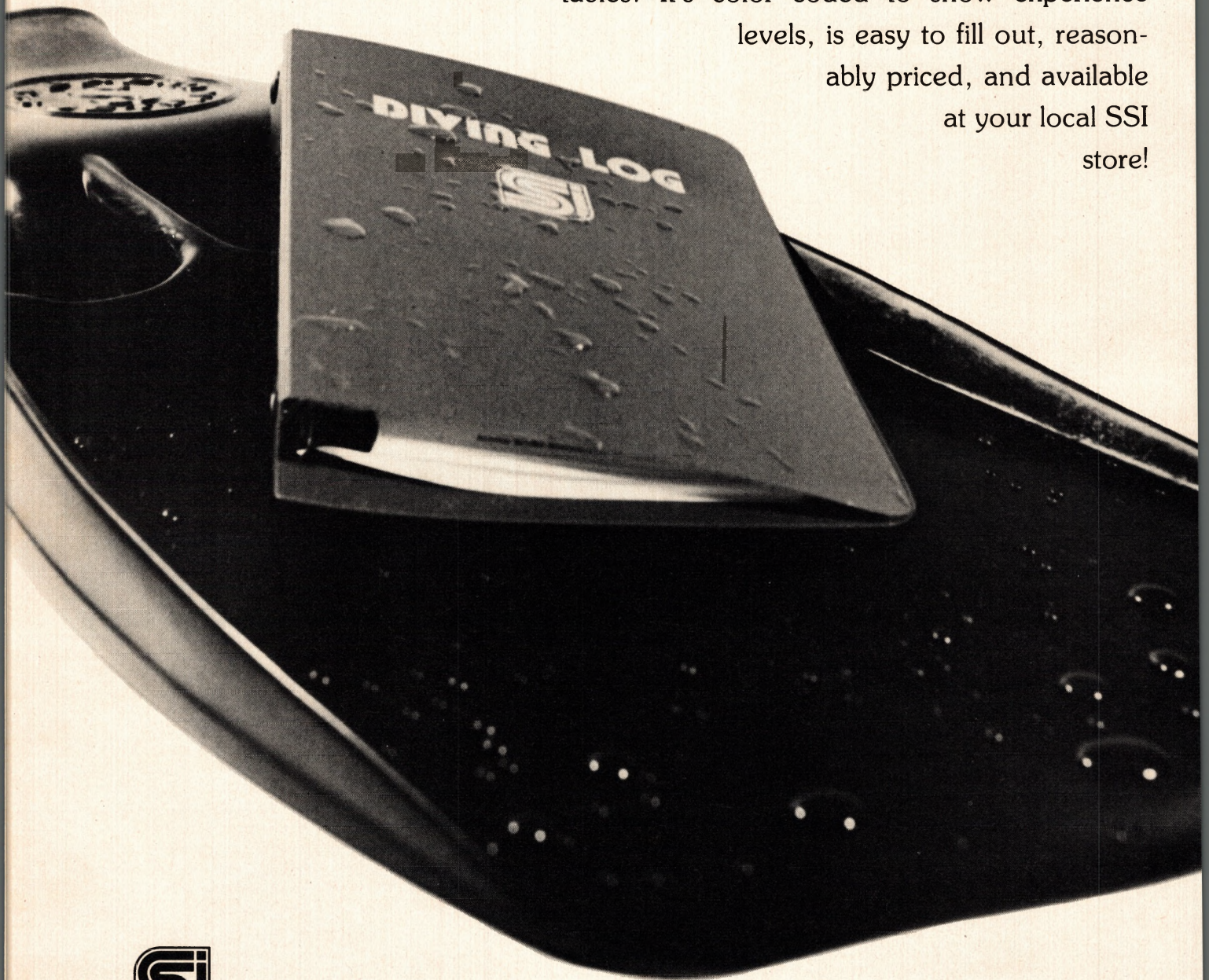
It has been said a man and his dog are inseparable. It should be true as well that a man (or woman) and his (or her) dog tag be inseparable, especially when that tag may reveal crucial information at a crucial time. Familiar with the Medi-Alert tags that inform doctors of patients who possess unusual medical histories, the people at Richcraft Products have come up with dog tags for the diving community designed to save a diver's life if push came to embolism. For details: Richcraft Products, Inc., Box 125, Kershaw, SC 29067.

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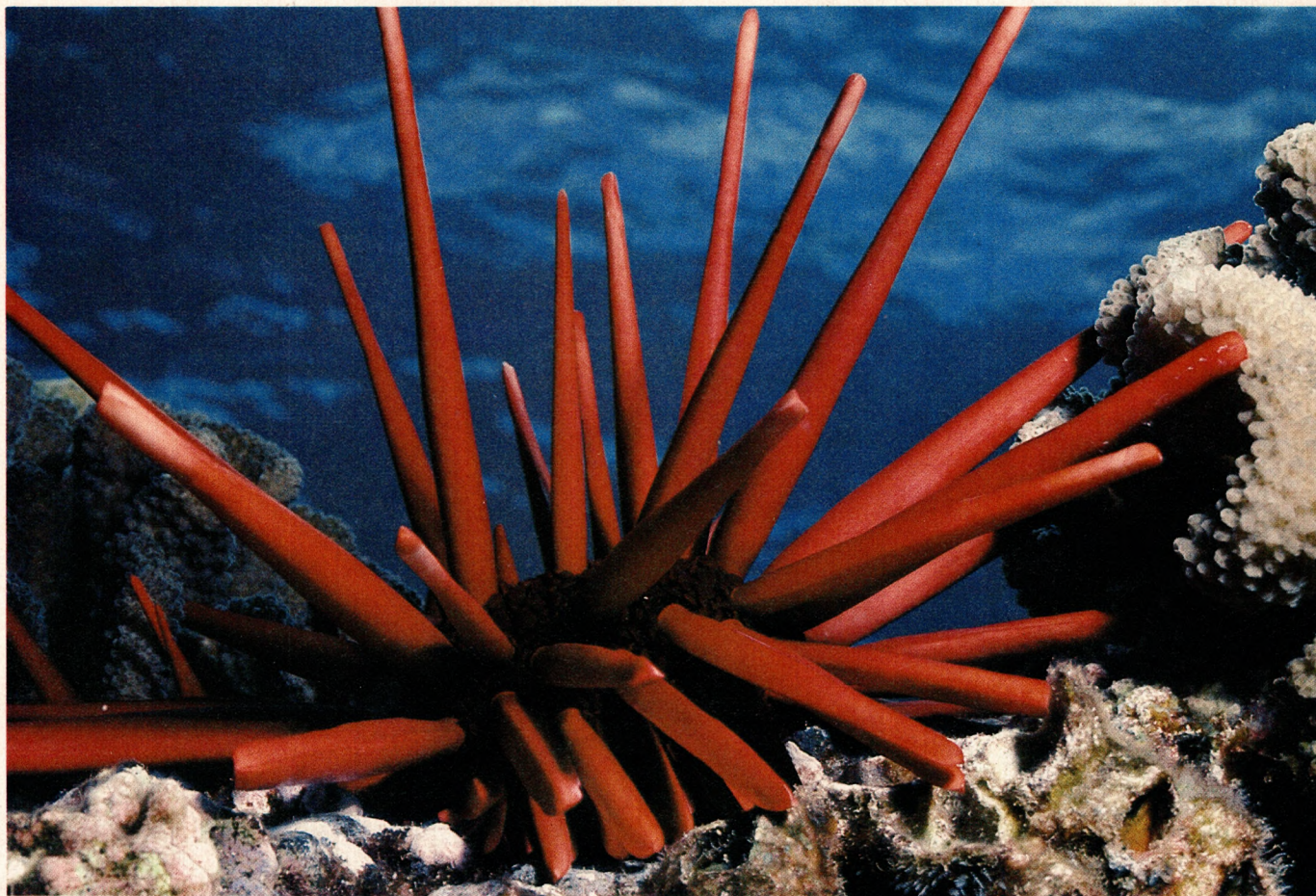
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In 35 feet of water off Lanai, an inch-long flatworm forages on a red sponge — an eye-jolting clash of color rare above water.



TOM STACK & ASSOCIATES

*The stubbier spines of the slate pencil urchin, *Heterocentrotus mammillatus*, serve as armor plating protection during its nocturnal grazing on algal growth.*



*Dressed for a costume ball, the harlequin shrimp, *Hymenocera picta*, is one of the few shrimp that feeds on starfish. They are an easily kept aquarium specimen, found in most of the world's warm oceans.*



*With a gait befitting its namer, a Reagle slipper lobster, family Scyllaridae,
parades its portly carapace and regalia before the lowly reef subjects.*

Portfolio:



ED ROBINSON

Intrusion by camera is a delicate affair which Ed Robinson has mastered. A charterboat operator by trade, he crafts his images with the soul of an artist and the scrutiny of a scientist.

*Found in pairs off Maui, Yonge's goby, *Cottogobius yongei*, has two measures of defense: clinging tenaciously to a stalk of vine coral and the transparency of its body.*

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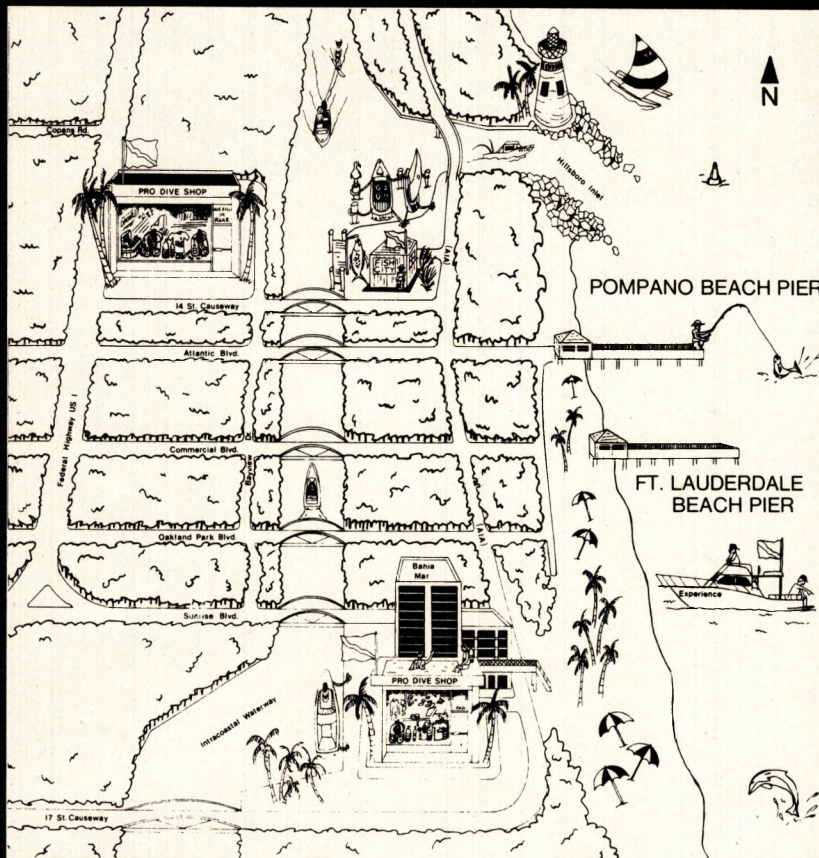


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EDGERTON *continued*

you'd have a hard time finding it. Dr. John Issacs is the one who gave me the idea that this pollution business is over-rated. Sure it's hard on some birds, it's hard on some fish, but nature has a tremendous way of flowing that water out and cleaning it up.

SD: What about Cousteau's warning that the oceans are being killed off?

Edgerton: He's right. For instance, along southern France the divers go in and shoot everything that moves — even have contests to see who can bring up the most.

SD: Is the human diver out-of-date as a scientific tool?

Edgerton: Sure. People in the water are pretty useless. You have to give them air all the time, they get cold, and they get lost. It's like all that space business, it's ridiculous to send people out there. You can do it all with remote control stuff.

SD: But science is a human affair.

Edgerton: Yeah, but now it's all wrapped up in the experiences of what happens to the guy up there. The science is kind of incidental. Everytime I go on an expedition the whole thing is wrapped up on the diving machine and the people and what they're doing — not on the project. My argument is: you can put a camera on the bottom and get nine-tenths of the things you want to know *easy*. All that should be done *before* you put a man in the sea. It seems like the people who like to go down for the excitement and the fun of it are running the show.

SD: Dr. Edgerton, in your first book, *Flash*, you published a schematic drawing showing anyone who wanted to know how to build a synchronous strobe unit. Have you always given away your knowledge?

Edgerton: Sure, what's wrong with that?

SD: You retired in 1968 and are Professor Emeritus at MIT. What are your plans for the future?

Edgerton: Well, as you know, I had a slight stroke six months ago, and I've got to live with what I've got left, and I've got quite a lot left, and I'm going to exploit it just as hard as I can.

I'm trying to get out a book of sonar pictures; I'm trying to gather all the classic pictures I've run into in the sea, and I've got stacks and stacks of them. But you know the world's a big place, and we've got lots and lots to do.



Edgerton: We're told we're cluttered up with too much data. We've got recorders and computers and submarines. Everybody's so busy with their toys they don't have the time to put on the real problems. We haven't got the people to sit down and discipline themselves to use the tools on the serious problems. They're not interested in getting out and living with these problems, getting seriously interested in them. Most around here are working on budgets. And they spend this all, to me, on trivia in the laboratory. Very few people get out on the ocean and do things. We need people to get going.

SD: Maybe it's late 20th century blues.

Edgerton: Well, I think it's a lack of desire. These people have been chasing these budgets for so long, they get turned down by so many people, that pretty soon the whole goal seems to be the budget. But to me the problem is the important thing.

SD: What, in your view, was the outstanding scientific breakthrough of the century?

Edgerton: The mapping of the bottom of the ocean, and also below the bottom. Right now the maps are incomplete; there are big areas that are blank. The point is, somebody has to be like Lewis and Clark — we've got to get out there.

My message is you build an instrument and go to sea, and probably within five minutes you find it's inadequate. You've become aware of what the problem is. You come back and redesign and rework it, and then you go out again.

SD: The late marine geologist, Maurice Ewing, once said he wished the oceans would dry up so he could see the bottom. Do you feel the same way?

Edgerton: No, no. The water's very important. No, it makes the problem serious. If it was dry then it'd be like Arizona and who cares about that?

SD: Do you see ocean pollution as a real threat?

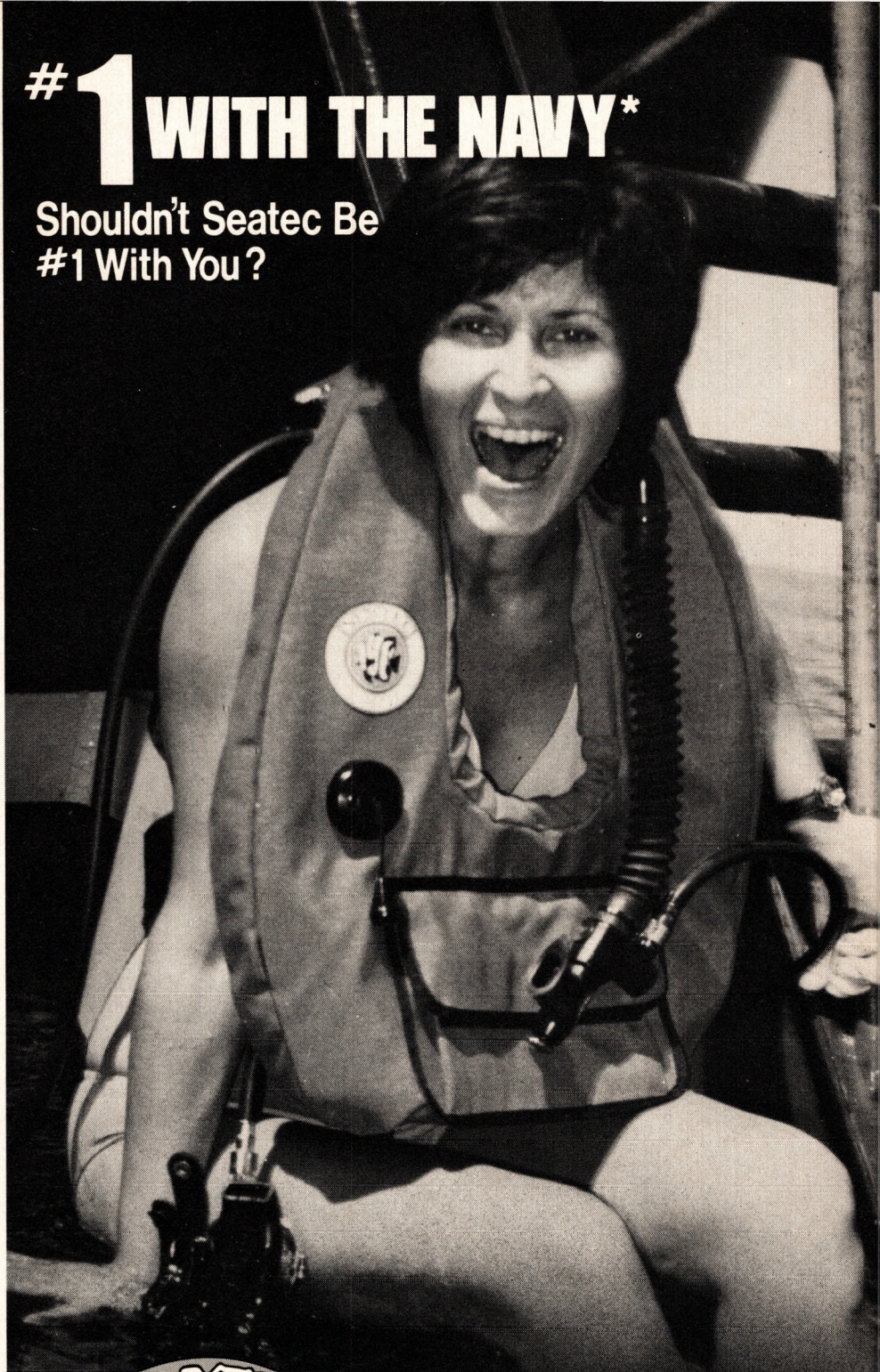
Edgerton: Oh, I don't think so. The ocean is so vast. You could spill 100,000 barrels of oil out there and the next day you couldn't even find it.

SD: But what about the biggest natural disaster of all time, the spill at the Bay of Campeche?

Edgerton: Now that's a nice big catastrophe, but probably if you go there now

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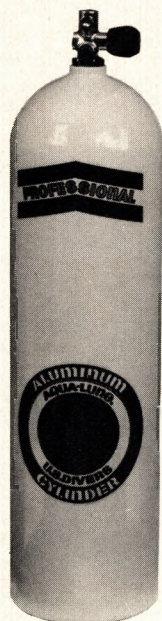
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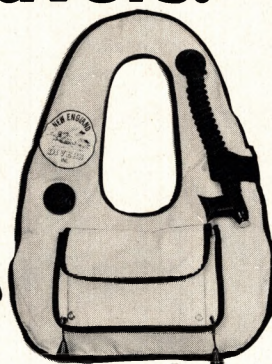
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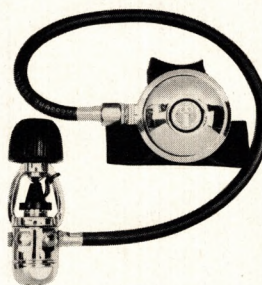
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EDGERTON *continued*

and they dropped their dredges. When we got on site at Puerto Rico, where they had to spend a week, I was the only one on board that had any projects. So I put my camera on the winch, and down it went, and it came back, and I developed the pictures in a little tray in the back—and there was no mud on the bottom! It was all rocks, a big jumble of rocks. Now this was in the Puerto Rican Trench, supposed to be full of mud two miles deep. But all I found was rocks, and they got real excited about it.

The next year they got an expedition together to dredge up those rocks, and I was Number One on the priority list. From that time on they thought, hey!—this camera is a real research instrument. Woods finally bought ten of them.

SD: Your cameras helped find the Civil War ironclad, *Monitor*, off North Carolina. But how about the deep wrecks, like the *Titanic*?

Edgerton: Well, the *Titanic* is at least 12,000 feet deep. You want to know where it is?

SD: Definitely.

Edgerton: We've got a little club and I carry the coordinates around in my pocket. It's 14 degrees 16 minutes north, and 50 degrees 14 minutes west. That's where it went down, but it may have drifted a little bit, so it may be a couple of miles off, maybe in an area ten square miles around there, and my sonar won't go 12,000 feet. I can build one, but I'm leaving that to other people. Let them have some fun out of it.

SD: In the mid-1970s you tried to find the Loch Ness Monster with side-scan sonar. Any conclusions?

Edgerton: I've been there [to Scotland] twice. The idea was to put a sonar at Temple Bay, about halfway down the Loch, and aim it out into the water. The camera is limited to five, maybe ten meters. But you can 'shine' the sound out and back for about 200 meters and it gives you an echo. We ran it 24 hours a day for a month, and we got two real good contacts. A great big thing came swimming in and went away. It's got to be at least as big as a Boston Whaler, maybe bigger. There's probably a crop of animals out there, but I'm not a marine biologist. What I'm saying is, we need more experimentation in there.

SD: What about marine experimentation in general—is there enough of it?

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EDGERTON *continued*

about it in your little newspaper.'

Anyway, I was impressed with his machine because I'd seen the FNRS-3 and supplied cameras to it. The first time I saw it was in Toulon Harbor [in France] with Cousteau. He said, 'Come on, I want to show you something.' He pointed down off the end of the dock, and I

*"Cousteau was my test
pilot. We spent a
whole day sketching out
projects and we
haven't done them all yet."*

couldn't hardly see anything; but I looked hard enough, and it looked like an overturned whale boat down there. Cousteau said, 'It's a submarine good for 14,000 feet. I said, 'Impossible,—you can't build it to go that deep.' But he said it was a different principal: the thin shell had gasoline in it for bouyancy and the sphere inside was thick enough to withstand the pressure. I thought, wouldn't it be great to get into that sphere, because we'd been working blind. I asked Cousteau what they were doing for cameras and lights; he said he didn't know, but he'd find out. I immediately wrote to [National] Geographic and asked them to give me funds to build a set of cameras and strobe lights. The next year we put them on the FNRS-3, as a gift to the French.

SD: Was there resistance to deep-sea photography within the scientific community during the 1950s?

Edgerton: I still remember asking a famous marine biologist about the use of deep-sea photography to study the oceans. His comment was, 'You're wasting your time, son.' He said the oceans were covered miles deep with a layer of mud, like deep snow.

So I built another camera and went to Woods Hole and said I'd like to go on one of their trips to the deep ocean to get pictures. They said, well, we're doing important research here and we haven't got time to fool around with *investigations*, but you can go along—don't need to bring your equipment—just go for the experience so you can become a 'real' oceanographer.

We got down to Savannah, GA, and we had an accident with the experimental TV. And we got down to Puerto Rico

but in those days the question was: What is it?

So, in our simple-minded method, we decided to make a camera and a strobe [unit], and make it big enough so it could be kept in sight with sonar, and put it in the DSL.

But we made a terrible mistake. We lowered the camera and we got pictures *above* and *below* the layer, and that destroyed the whole technical paper we were going to write, because it showed the same things we saw when the camera was *in* the layer. It ruined the whole thing! So today I say to my students, 'I don't want you taking too much data. When you go into the laboratory you get just enough to prove just what you want to prove.' Then once in a while they take me seriously, and I have to throw a piece of chalk at them.

SD: What was the goal of your first outing with Cousteau in 1953?

Edgerton: We planned a session on the deep scattering layer and he invited me aboard *Calypso*. Back then Cousteau was using housed, hand-held cameras, but he was using flashbulbs. You see, when you've got the camera with you, you can put the bulbs right in. But if it's two miles deep you've got to take one picture and pull it all way up and put another bulb in; you're wasting an awful lot of time. So the strobe, as we envisioned at the time, was only for deep photography, where you want to take 2000 pictures and depend on the law of probability. You take all these pictures and most of them are out of focus or of the wrong place. But there's only one way of doing it, and it's not very satisfactory, I admit.

SD: Did you find a way to beat the odds on getting good pictures?

Edgerton: The bottom of the ocean is fairly flat, so I invented the pinger to hold the camera a given distance above the bottom. It's one of the most important instruments in oceanography because it tells you exactly how high your camera is off the bottom.

SD: You also worked with Jacques Piccard and the deep diving bathyscaphs.

Edgerton: I visited Piccard in Italy when he had the *Trieste*. A newspaper would give them enough money to buy steel shot, the stuff they drop to come up. The newspaper said they have to have an exclusive story, so Piccard said, 'Okay, you buy me two tons of shot and you can dive with me, and you can put the story

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EDGERTON *continued*

instead of going down the camera went up. It hit a shackle and broke.

I finally did get the camera put back together, and we did get it in the ocean, and on the fourth try we got a picture of a siphonophore [free-swimming snail]. I've probably taken a million pictures since and I've never seen another one on a single frame.

SD: And that sent you to the National Geographic Society for support?

Edgerton: I did bombard the Society. I kept writing them letters. I told them they were sending people all over the world climbing up mountains and taking pictures of deserts, and they ought to spend some time underwater. To do this they needed equipment designed for ultra-high pressures and I was their boy. I got various letters back; some of them enthusiastic, some of them not. This went on for several years. Anyway, they finally saw some of the early pictures, and I think it was Gilbert Grosvenor who called and said, 'There's a young man from France who's interested in underwater research, and we'd like to send him up to Boston to see you.' Grosvenor said he was sending him on the night train. Well, this fellow came up on a sleeper, and it was a guy with a big schnozzle named Jacques-Yves Cousteau, who I'd never heard of in 1952.

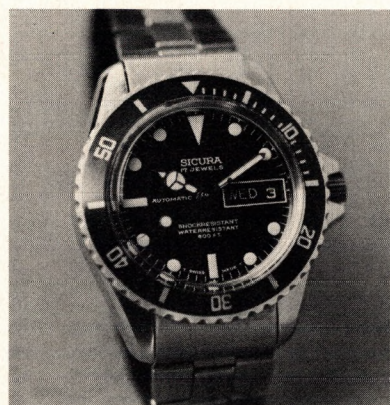
We spent a whole day together working on cameras, uses of cameras, and he hadn't been here more than an hour when I had him in a swimming pool. I'd just bought an aqualung about a month before and I didn't know he had anything to do with it. I had a camera I was testing, so I got some delicious pictures of him swimming in the MIT pool. He was my test pilot. We spent maybe 12 hours together, sketched out a whole bunch of projects, and we haven't done them all yet.

SD: What's working with Cousteau like?

Edgerton: If you write him letters you never hear from him. But when he wants something the phones and the telegraphs are busy. It's a one-way street. But we've cooperated with him for 20 years.

SD: How did your first *Calypso* voyage go?

Edgerton: We spent quite a bit of time in Boston talking about the deep scattering layer, or DSL—a layer of matter that in the daytime goes down to about 1000 feet, and at night comes to the surface. It's presumed to be of biological origin,



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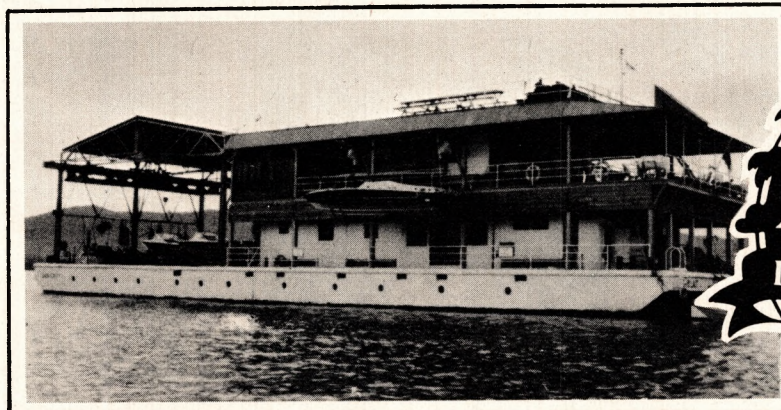
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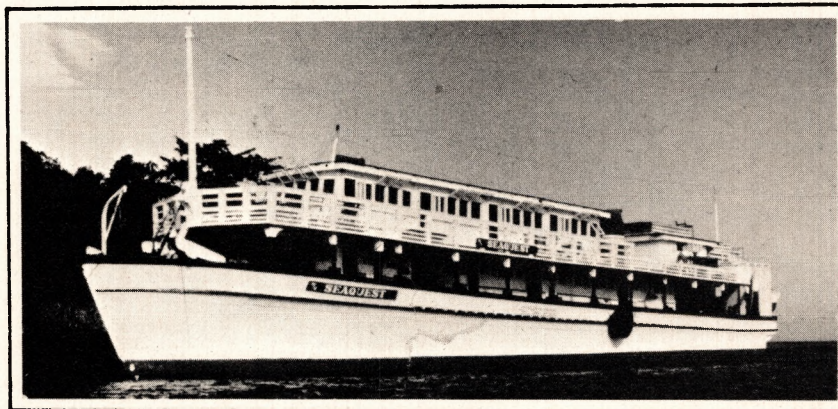


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Profile:

Dr. Harold Edgerton

*Quiet, unassuming, an electronic genius.
Meet Papa Flash, the man who illuminated the sea and
in doing so, inaugurated a new era in underwater discovery.*

BY PHIL TRUPP

He appears so unassuming, Papa Flash does, alert and yet preoccupied, as he moves with a slight limp around the campus of the Massachusetts Institute of Technology, at Cambridge. Who would imagine this 77-year-old wizard of an electrical engineer has given the whole world timeless moments of wonder?

Papa Flash is Dr. Harold E. Edgerton, inventor of ultra-high speed strobe photography. More than 40 years ago he hooked his magic light to his magic cameras, and for the first time we experienced the world in brilliant, startling flashes — "crowns" of liquid impacting more liquid, the stopped motion of a hummingbird's wings, the swinging drive of a golf pro, a rifle slug impacting a light bulb. These stop-motion photographs have revolutionized photography, art and, finally, oceanography.

From the window of his graceful apartment one can see the Perpetual Life Insurance Building flashing a strobe light, which Edgerton helped install. Amazing: he invented

it as an MIT student in the early 1930s, and now it lights up the sky — a monument to that prophetic student.

Perhaps the most intriguing facet of Edgerton is that in his heart he is a seaman who grew up far from the ocean in Nebraska, but who absorbed Captain Nemo's adventures. And in going to the heart of his affection, he took lights and cameras to the deepest wells of the sea to show the world the mysterious seascape miles below the surface, just as Captain Nemo did through his student, Jules Verne.

Edgerton the seaman has been just about everywhere. He has lit up and photographed the world's oceans, giving us historic images of what's down there, and mapping the floor of the sea.

On the final day of our interview Harold played his guitar, gave me a lesson in "bones" rattling, and sang "You Are My Sunshine" to his wife, Esther. At that moment it was clear he is not a man upon whom a modest writer dares to improve. Edgerton is an American original.

Sport Diver: Your invention of ultra-high speed strobe photography literally changed our view of the world. How did it change yours?

Edgerton: I was at MIT photographing motors and how they operate, and Dr. Stark Draper [with MIT and the National Aeronautics and Space Administration] said, 'Why don't you quit fooling with those stupid motors and get out in the real world. There's all kinds of things that need to be photographed.' Well, I said to him, 'Like what?' I was motors, motors, motors. But Draper did make me sit up and I thought, hey, the world is filled with all kinds of things.

First I went over to the faucet and took a picture of water coming out. Then I went over to Draper's lab and took pictures of all kinds of things. There was no end to it.

I'd say flash opened the world to me, certainly, but it also helped me to help other people.

SD: Flash took you to Hollywood in the 1930s to make a movie called *Quicker Than A Wink*.

Edgerton: Yeah, we built a camera — full 35mm — and took shots of milk drops and cats falling; all sorts of things, and somebody in Hollywood heard about it, and MGM sent a representative to look at my footage. He allowed that it was pretty amateurish, but he said I should send it to Hollywood and they'd help me make a short under the supervision of Pete Smith. He used to put out a short every month — a one-reel epic. So we went to Hollywood.

Well, I found out movie people talk a lot; they think they know everything, but my camera was a complete mystery to them. Whoever heard of any camera going 1000 frames-a-second? We did have a lot of trouble with it, but I educated them.

The movie did get an Oscar for best short of the year. They must have been thin on good shorts that year because technically it was quite deficient. But it did have a lot of punch lines and it was fun to make, and it's still around.

SD: Did you become an overnight smash?

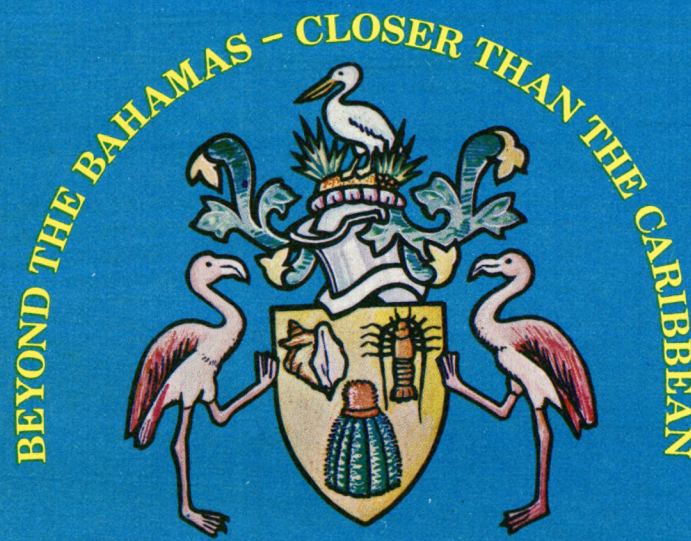
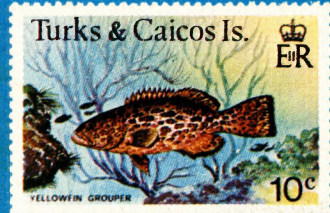
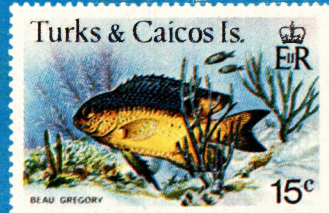
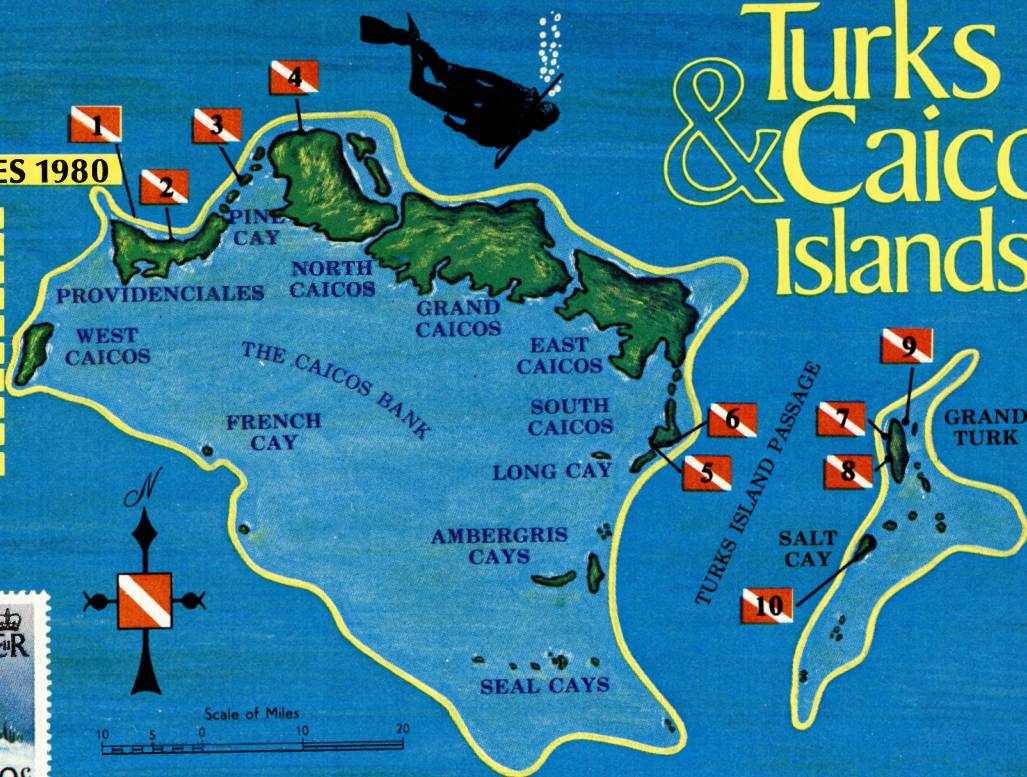
Edgerton: I've never pushed this thing, trying to make a big thing out of it. Anyway, I went out for patents, and I got a lot of them, but they've all run out.

Phil Trupp is *Sport Diver's* Washington correspondent.

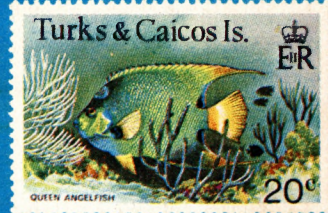
Dive

DIVE CENTRES 1980

1. Provo Turtle Divers
2. Royal Divers
3. Pride Divers
4. Seaquatic Divers
5. Turk-Cai Watersports
6. Caicos Reef Lodge*
7. Pepecor
8. Underwater Research
9. McCartney Resort Village
10. Salt Cay Dive Camp*



Tourist Information: (305) 592-6183
P. O. Box 592617, Miami, Florida 33159



Turks & Caicos Islands Philatelic Bureau, Grand Turk, West Indies

Circle #85 on reader service card.

SPORT DIVER DESTINATION DATA

GENERAL

Location: 22 miles southeast of Long Beach, Cal.
 Size: 76 square miles
 Topography: hilly island, with many small coves in a shoreline of cliffs.
 Climate: Temperate, averages of 58-76 June through October and 49-63 November through May. Rainfall averages 9-12 inches annually
 Population: 2000
 Largest town: Avalon
 Economy: 97% tourism, 3% agriculture
 Diving season: year-round
 Tourist season: April-October

DIVING

Water temperature: summer, 67-73, winter 59
 Visibility: 40-100 feet, depending on season and location
 Depth of dives: 5-165 feet
 Types of diving: wreck, beach, wall, rocky reefs, caves, kelp
 Skill level: novice, intermediate, advanced
 Sights: Fish: opaleye, senoritas, bass, garibaldi, tree-fish, sheepshead, blackfish, sharks
 Shells: abalone, kelp snails
 Invertebrates: nudibranchs, sea stars, anemones, squid, sea urchins, sea cucumbers, eels
 Other: rays, octopus, wrecks of pleasure boats
 Restrictions: no spearfishing within Avalon city limits; permits required to dive on *Valiant Farnsworth Bank* is an ecological reserve

DIVING SERVICES

Instruction available: resort course, open-water certification, advanced open-water certification, instructor clinics
 Equipment rental: fins, weights, mask, snorkel tanks, backpacks, regulator, BC
 Equipment sales: all the above
 Equipment repair: none
 Camera repair: none
 Air: yes
 Guides: yes
 Dive charters: Long Beach: *Mr. C*, 547-1131; *Liberty*, 547-1131; San Pedro Sport Fishing Landing: *Scuba Queen*, 547-2236; *Blue Sea*, 833-1577; *Westerly*, 833-6048; *Atlantis*, 375-9720; *Charisma*, 326-7460; *Golden Doubloon*, 831-5148; *Wild Wave*, 534-0034.
 Bareboat rentals: Avalon Boat Stand, Avalon, 510-0455; Island Services, Avalon, 510-2041

DIVERSIONS

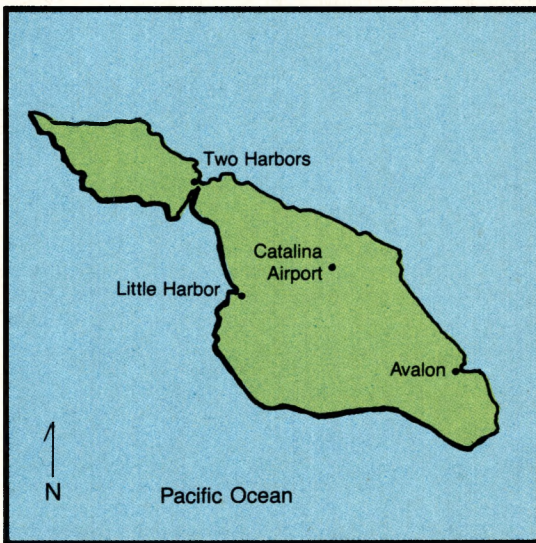
Ground transportation: taxi, tram, bus, bicycle, electric cart
 Shopping: souvenir items
 Nightlife: movies, bars, miniature golf, pinball arcades, monthly dances (May-December)
 Other sports: boating, waterskiing, fishing, golf, tennis, biking, horseback riding, hiking, swimming
 Don't miss: inland motor tour, bison, Avalon Casino and Museum, flying-fish boat rides (seasonal) and Wrigley Memorial and Botanical Garden

JUST IN CASE . . .

Hospitals: Avalon Municipal, 510-0700; emergencies: 911
 Diving doctors: none
 Recompression facility: USC Marine Science Center, Big Fisherman Cove
 Police: 510-0174
 Marine Rescue: Coast Guard, Long Beach, 590-2225, 590-2230; Harbor Master, Catalina, 510-0535

ON YOUR OWN

Land tours: Avalon Taxi & Charter Service, Box 321, Avalon, 510-0025; Santa Catalina Island Co., Box 737, Avalon, 510-2500; DFR Transport, (specializes in divers), #1 Cabrillo Mole, Box 782, Avalon, 510-1164, 510-1446.
 Airlines: CAT Air, (seaplanes from Long Beach Airport,) 420-1883; Harry's Flying Service, (single-engine, fixed wing from Long Beach Airport,) 510-0359
 Airports: Airport-in-the-Sky for private planes
 Marinas: Moorings in Avalon, Two Harbors, other coves
 Cross-channel boats: Catalina Cruises, from Long Beach and San Pedro, (213) 832-4521, (213) 775-6111, (714) 527-7111
 Hotels with dive packages: none
 Hotels: Consult Avalon Chamber of Commerce, (213) 510-1520
 Campgrounds: Little Harbor, Black Jack, Little Fisherman Cove, Parson's Landing and Avalon's Bird Park; request map (213) 510-0688
 Random Notes: Come & Go Travel (specializes in diving packages,) 1153 S. Pacific Coast Hwy., Laguna Beach, CA 92651, (714) 497-2402; Catalina Chamber of Commerce, "One Call Does It All," 510-1520



SANTA CATALINA ISLAND

tank should be expended this way. Then the diver can ride the current toward the boat, pausing for interesting features on the return.

When diving Avalon's Casino Point there are but few strong currents to complicate matters. An underwater park on the northern side of the small promontory supporting the circular casino contains four wrecks, a reef and a kelp bed. It is roped off for divers, and during the summer a dive barge and van are available with air compressors nearby.

Farther into Descanso Bay, or West Harbor as the cove about the point is sometimes called, is the wreck of the *Valiant*. The 175-foot steel yacht was scuttled in 70 to 90 feet after reportedly burning for four days in 1928. While her valuable metals were salvaged long ago, \$67,000 in jewelry has never been found.

Avalon's harbor office requires divers get a permit to investigate the *Valiant*, but don't hold your hopes too high in the summer. The area's heavy boat traffic is usually reason enough to deny the permit; better to try during winter months when the water is clearer. A harbor-master permit is needed to dive within the city limits, except for Casino Point Park. And spearfishing is not allowed within the city limits.

Lover's Cove and Abalone Point, southeast of the ship dock known as Cabrillo Mole, is an underwater preserve set aside for glass-bottom boats. Only snorkeling is permitted in this varied kelp garden that is home to opaleye,

spotted bass, garibaldi, blackfish and many other creatures. During the summer when glass-bottom traffic increases even the snorkelers are likely to be shooed away by harbor patrols.

With the understandable restrictions on diving around Avalon it is a relief to find multiple land attractions. Visitors can rent bicycles, electric or gas-powered carts, take sight-seeing tours run by the Santa Catalina Island Company, or just walk the steeply hilled town. Tennis, golf, watersports, and dancing to the Big Band sound in the casino are Avalon's topside diversions.

Outside of town, cactus and other desert plants take over, reminding visitors this arid island receives less rainfall annually than Los Angeles. A four-hour motor tour organized by the Island Company rumbles over an old stagecoach route that is only partially paved. Passengers are exposed to a cross-section of influences that have shaped Catalina's history: wild goats from the early Spanish sailors, a bison herd that grew from a few animals imported in the 1920s to film a silent movie, an Indian burial ground, a stagecoach stop, an airport, a 330-million gallon reservoir and the horse breeding El Rancho Escondido where the Philip K. Wrigleys raise pure-blood Arabians.

The Wrigley family, heirs to chewing gum magnate William Wrigley Jr.'s love for Catalina (as well as his substantial investments), dominates the Island Company. In 1975 the Santa Catalina Island

Conservancy, a nonprofit foundation, gained title to 86 percent of the island from the company. A year earlier Los Angeles County, under whose legal jurisdiction Catalina falls, and the conservancy had negotiated an exchange of 50 years of park and public recreational use for a drop of the island's tax valuation. It was reported the Island Company, then headed by Philip Wrigley, would receive a break of \$275,000 annually.

Since then the conservancy has worked hard to further the Wrigley family's preservation programs and philosophy. While the deal with the county expanded the number and quality of campsites, the conservancy maintains the roads, trails and the airport, controls the grazing animals and generally safeguards the flora and fauna on its 42,139 acres. Recently the foundation started a program to preserve the bald eagle population on Catalina. Of six eaglets released last fall, one reportedly flew east toward Newport Beach but the others stuck to the island.

Our driver on a ten-mile bus tour of the preserve, an intelligent, humorous Avalon resident, promised us when the ride was over we would be aware of the richness of our surroundings. He was right. Even on a dry, cactus-carpeted island there is much to stimulate the eye and the mind. Add the smorgasbord of delights awaiting undersea and you can only wish that Samuel Prentiss had been along to learn where Catalina's true treasures lie.

At Your Service

The following dive operations provide tours and equipment rental for Santa Catalina Island.

Argo Diving Services/Jon Hardy
Box 1201, Avalon, CA 90704
(213) 510-2208

Catalina Divers Supply/Carol Dunlap
Box 126, Avalon Pleasure Pier, Avalon, CA 90704
(213) 510-0330, 1286, 1954

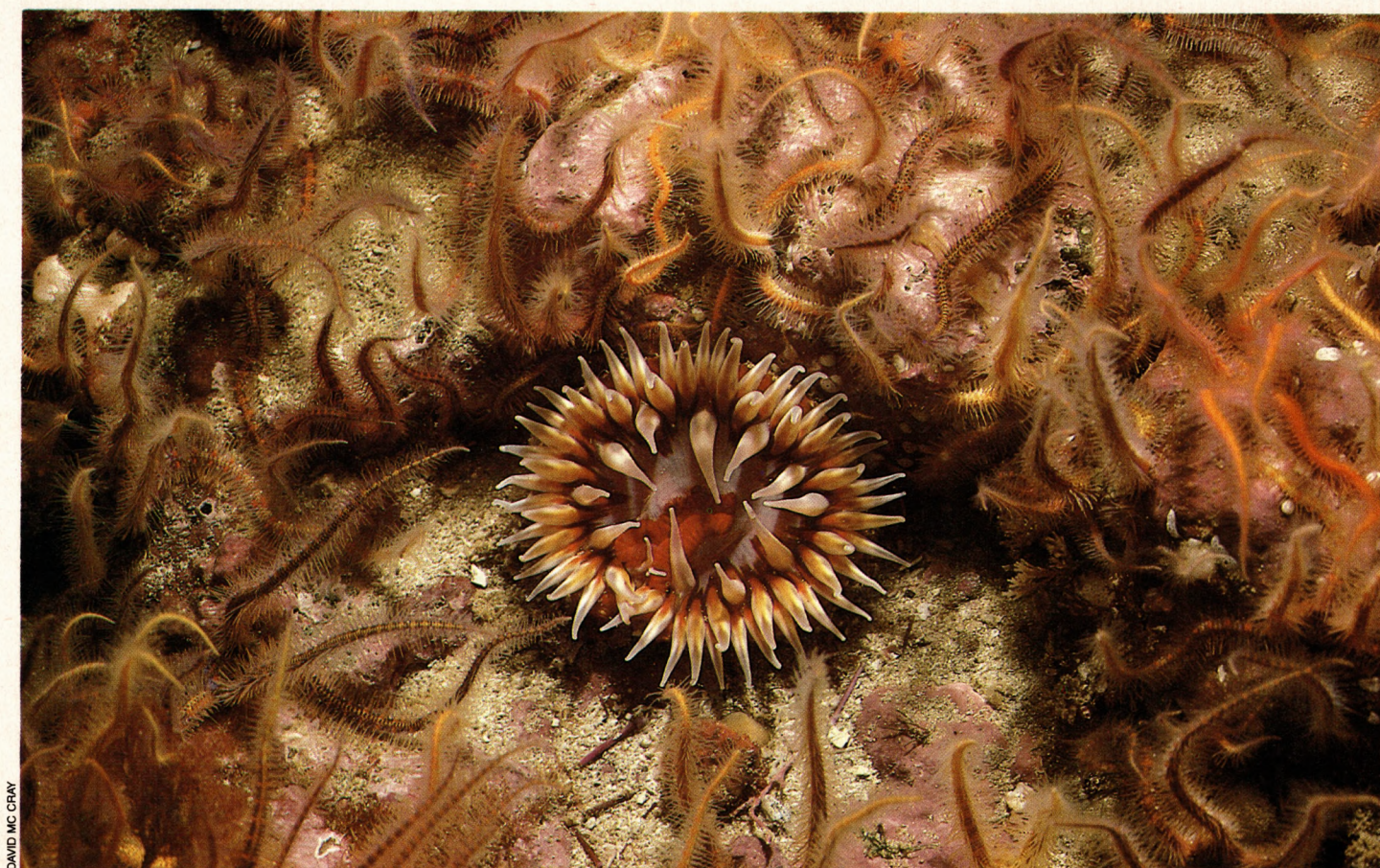
Catalina Island Marine Institute/Ross Turner
Toyon Bay, Catalina, CA 90704
(213) 510-1622

Cove and Camp Agency/Doug Bombard
Village at the Isthmus, Catalina, CA 90704
(213) 510-0303

Island Marine & Sports/Tom Miller
124 Catalina St., Avalon, Catalina, CA 90704
(213) 510-0238

												
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 Dive/Hotel Packages  Live Aboard Boat Charters  Night Dives  Retail Sales  Gear Repairs  Day Boat Trips
 Snorkel Trips  Boat Charters  Full Certification  Tank Rentals  Gear Rentals  Resort Course  Air Station



DAVID MC CRAY

Medusa-like with their hypnotic arms, these brittle stars, Ophithrix spiculata, surround an anemone.

cernible reason last summer the patients averaged one a week. Dr. Pilmanis says the chamber takes bends victims from all over, not just Catalina. "We've had them from Guyamas [Mexico], San Francisco, Arizona, lakes in the interior — anywhere."

The hyperbaric chamber is one of the highlights of a tour Pilmanis, Given or one of their associates may conduct, time permitting, for dive groups that have arranged in advance to visit the center. Unless it is a rare USC extension class, the center no longer offers beginning diver training to the public. Indeed, except for courses offered through Avalon's Argo Diving Services, there is no certified diving instruction on Catalina.

According to experienced island divers, 90 percent of boat diving is done on the west end of Catalina between Emerald Cove and Blue Cavern Point. Starting from Samuel Prentiss's old hangout at Emerald Cove, favorite spots include Eagle Reef, the rocky tip of lovely Cherry Cove, the shallows and deep-water drop-

offs of Ship and Bird Rocks, and intriguing Blue Cavern Point where several short passageways have been tunneled by the waves. Kelp forests are thick around the point, past Spouting Cave and to the quarry that provided rock for many Southern California breakwaters. "There really isn't a bad dive spot around here," says one veteran Catalina diver.

However, many of the spots, such as Eagle Reef, Ship Rock and Bird Rock, have tricky currents that can be hazardous if caution is not exercised.

On the other side of the Isthmus, in Catalina Harbor, are several wrecks in less than 60 feet of water. Probably the most famous is the *Ning Po*, an 18th century Chinese junk that chartered a bloody career through the dark side of seafaring until she ended up a motion picture prop. She was either dynamited in cinematic battle or disintegrated under the ravages of time and the sea — depending on which source you believe — and now lies barely visible in the mud inside Ballast Point.

Ronnie Damico, diving officer at the USC Marine Center, says there are a few beaches on the windward side to dive, but there isn't much in the scenery department. Little Harbor, which has good

surf, and Ben Weston beaches are accessible by dirt roads. However, a swim out from their shores is necessary to reach the more scenic underwater areas which harbor kelp communities, abalone and lobster.

Probably the most attractive, and treacherous, dive spot on the windward side is Farnsworth Bank some three miles southwest of Ben Weston Beach. It is an ecological reserve because it has the only known purple coral on the island. No souvenirs are allowed, including rock samples.

Farnsworth has strong currents and sheer sides that can plummet 35 fathoms. Only last fall four divers lost their lives off the bank in Catalina's worst recorded diving accident. The common explanation is that they went down too deep and used up too much air fighting currents, then panicked when the tanks went dry.

Robbie Meistrell, who learned to surf off Emerald Cove when he was five and has been diving Catalina for 18 years, advises divers to learn to work with the currents. Using the lay of kelp fronds for direction, a diver should swim against the current toward the destination. Perhaps the first 1000 pounds of air in your



ALL DAVID MC CRAY

Rock has a varied submarine terrain. Giant kelp fronds and patches of eel grass punctuate the 15- to 40-foot shallows; then a steep dropoff of 100 to 120 feet provides a wall canvas for gorgonia, sea urchins, sea stars and a strange mushroom-like growth.

As we swam over the shallows, inspecting creatures feeding on the kelp, we noticed a small bed of spiny purple urchins divided by parallel white ropes.

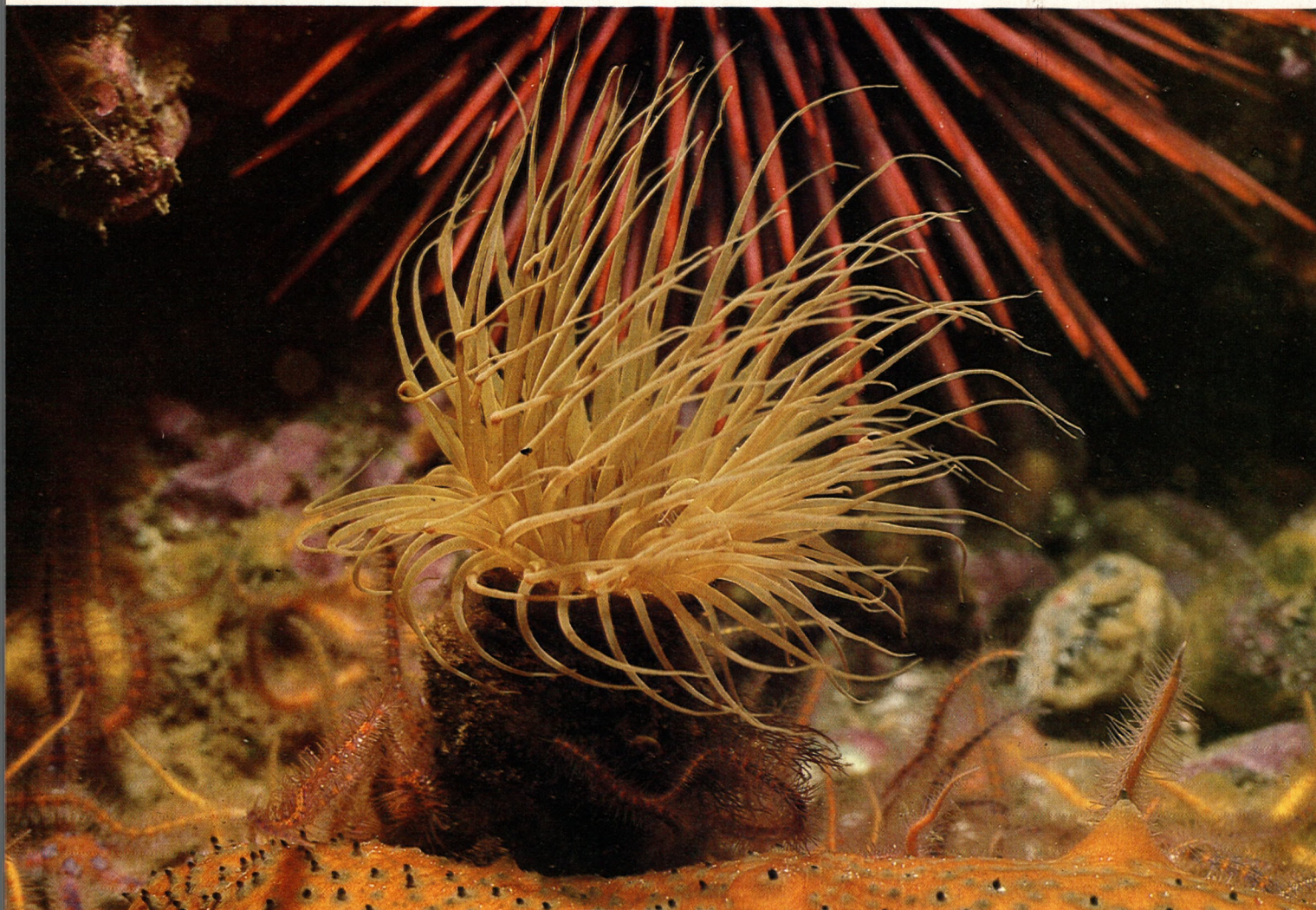
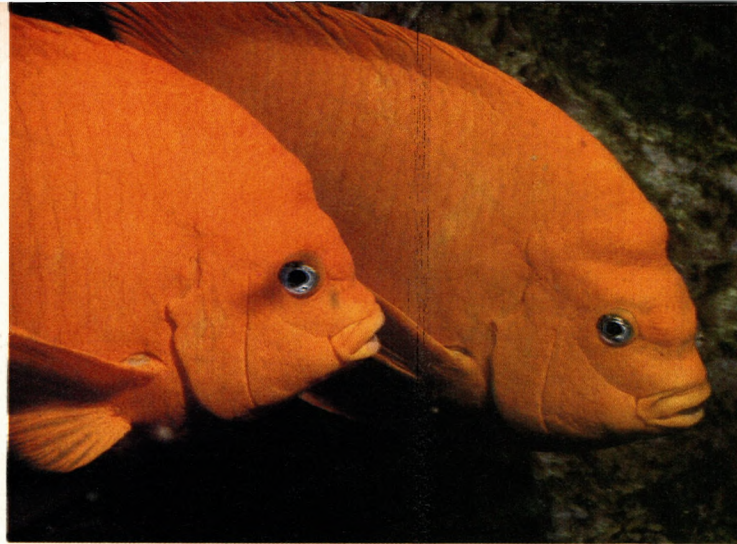
It was a research project, probably by one of the 150 scientists affiliated with the University of Southern California's Catalina Marine Science Center in nearby Big Fisherman Cove.

This project was farther from shore than I had expected from an earlier conversation with center director Dr. Robert Given. He runs a major scientific training and research field station unique to the Channel Islands. Most of the cen-

ter's undersea activities are concentrated in Big Fisherman Cove, so outside divers are asked to be cautious if they venture into these waters.

The center is also home for the only multi-person decompression chamber within hundreds of miles. Dr. Andrew Pilmanis, honcho of the hyperbaric chamber operation, estimates that through last summer the chamber averaged three patients a month. For no dis-

Right: Seeming to whisper, these garibaldi, *Hypsypops rubicundus*, add vivid color to the surrounding Southern California water. Facing page: Considered a menace to the abalone population this starfish, *Henricia leviuscula*, makes its way toward nourishment. Below: The tube anemone, *Cerianthus* sp., is only one of a number of different varieties of anemone near Santa Catalina Island.



very infrequent (usually between November and March) but fierce winds from the northeast, called the Santa Anas, the protected side of Catalina is the one facing the mainland. This side boasts favored dive spots as well as most of the 900 mooring sites.

On the west end, where the Isthmus narrows to one-half mile, the encampment at Two Harbors provides air, food, fuel and landing permits through the

Catalina Cove and Camp Agency. All along the island, bays and coves are leased to private groups, and permits may be required to land on their beaches or use their moorings. The *Chart Guide for Catalina Island* has detailed information on such requirements as well as useful navigation data.

Beware the shoal markers for Harbor Reefs between Bird Rock and Isthmus Cove as you head into Two Harbors.

The day we explored the area, a fishing boat had ignored the buoys; damage to its rudder and prop required a tow from the local harbor-office boat.

Near the mouth of Isthmus Cove is Bird Rock—a low, guano-daubed white mound frequented by brown pelicans, cormorants, gulls and other sea birds. Unprententious above water (particularly in comparison to the jagged tooth of Ship Rock farther out from the bay), Bird

crude map of the location was drawn for the adventurer.

Prentiss, who had the dubious distinction of being in the first recorded shipwreck at what is now San Pedro, built himself a vessel from salvaged materials and headed for Catalina. Before he could reach safe harbor a severe northeaster washed overboard most of his belongings—including the map. Undaunted, Samuel Prentiss raised a cabin above Emerald Cove and for the rest of his life he fished, hunted sea otter, and sold to mainlanders firewood from trees he'd chopped down in quest of his will-o'-the-wisp wealth.

True or not, the tale of Prentiss's lost treasure—some say it was pirate plunder from Mexico, others claim it was Indian in origin—is firmly imbedded in Santa Catalina lore. This kind of historical embroidery lends a special aura to the island and another lure to divers.

Each year more than a half-million visitors make the 22-mile trip from the mainland to Avalon on the east or Two Harbors (also called the Isthmus) on the west. Most arrive in late spring or during the summer months, though nearly 27,000 tourists visited the island last November. A number of these winter visitors are divers on weekend jaunts; people whose budgets are squeezed by the energy/financial crunch, but who refuse to resist the ocean's call.

The two-hour public boat trip on Catalina Cruises from Long Beach or San Pedro is inexpensive (\$15 and change roundtrip). However, all supplies, services and accommodations on the island are a bit more expensive than the mainland from whence all necessities come. Dive equipment rentals from Avalon's two shops, or the concessionaire at Two Harbors, are about equal to mainland prices, but selection is limited. They have no underwater lights or cameras, for example.

Staying in an Avalon hotel can be expensive/chancy as not all establishments encourage a diving clientele. Facilities for cleaning dive equipment are not available at all lodgings. And in the prime tourist season—Memorial Day through Labor Day weekends—you'll hunt a bit to find a bed in Avalon.

There are also some seasonal restrictions if you require local support services, but this is changing as more facilities open for post-Labor Day travelers. Many stores and restaurants close during fall and winter; the dive store on



VIC COX



BOB EVANS

Pleasure Pier opens three days a week. Boat rentals are not available out of season but local people and representatives of the Visitor's Information and Services Center are helpful in arranging contact with proprietors.

Water clarity is also related to seasonal changes. Summer blooms of plankton lessen visibility to between 40 and 80 feet. While the water is colder in the winter, visibility can hit 100 feet in some locations. An advance call to the Avalon harbormaster may be advisable to check on weather and water conditions.

A Catalina jaunt may not be a cheap date, but a diver would need to search long and hard to find a better buy. Kelp beds flourish along most of the island's 54-mile perimeter; caves pock volcanic cliff walls in several areas, especially

*Facing page: Bending and shaping light like itself twists and contorts, bull kelp, *Macrocystis pyrifera*, is shelter and food for myriad of life. Top: Gazing over Avalon Harbor gives hints of times past as the casino-now-museum stands sentinel. Above: Divers are engulfed in eel grass beds near Catalina's Bird Rock.*

around Blue Cavern Point; fish and other marine life are abundant. Wrecks are there to be explored and campsites for beach dives can be found on either side of Catalina.

Many sport divers come to the island in charter boats or vessels belonging to the scores of mainland dive schools and stores that run to the island for pleasure and profit. Except during a spell of the

Santa Catalina Island

*Shipwrecks. Chewing Gum. Arabian horses. Add them to tales of buried treasure and kelp forests **this** thick and you've the beginning of Southern California's best diving.*



DAVID DOUBILET

BY VIC COX

A wind-buffed stone marker stands erect over Emerald Cove, a sandy bite out of the lee side of Santa Catalina Island's western tip. The tablet commemorates Samuel Prentiss, a Massachusetts man who lived on the island 30 years before dying there in 1854.

*A Southern California-based freelance writer, Vic Cox is an avowed whale fanatic and a former editor of **Westways**.*

Prentiss is thought to be Catalina's first white settler; he is its first documented treasure-seeker.

Indians lived off the Southern California coast on Catalina for about 4000 years before Juan Rodriguez Cabrillo claimed the isle for Spain in 1542. Three centuries later, so the story goes, an Indian chief whom Prentiss befriended on the mainland told the New Englander of riches buried near a tree on the island. A

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#4080 QUICK MOUNT I

The **SUBSTROBE 150L** is the new, improved version of the **SUBSTROBE 150**. The 150L is lighter underwater, (approximately one ounce negative), has a more dependable circular flash tube, and a longer connecting cord. Add these to the proven features of the **SUBSTROBE 150** and the **SUBSTROBE 150L** is unquestionably the finest submersible strobe offered today.

SUBSTROBE 150L features:

ENERGY RATING

Adjustable power output of 40 watt-sec., 75 watt-sec., 150 watt-sec.

POWER SOURCE

Interchangeable NI-CAD battery pack

CHARGERS

Chargers are optional. Select from a 15 hr. or a 3 hr. charge rate.

NUMBER OF FLASHES/RECYCLE TIME

@40 watt-sec.	approx. 600/1.5 sec.
@75 watt-sec.	approx. 300/3.0 sec.
@150 watt-sec.	approx. 150/6.0 sec.

WEIGHT IN WATER

Approximately one ounce

ANGLE OF COVERAGE

100 degrees

MODELING LIGHT

Assists in aiming strobe

SLAVE

Slave on/off switch allows firing by another strobe if desired.

MOUNTING BLOCK

Universally adaptable — fits all IKELITE Quick Mounts or Strobe Mounts.

QUICK MOUNT I

This unit's ball socket adjustment with finger-tip control and 22" variable extension arm offers infinite variations for positioning the light source. One hand control of the quick-release lever allows the light source to be easily removed, hand held and remounted underwater. Mounting devices are included for strobe housings and Substrobes. The Quick Mount series mounts to all IKELITE mounting bars and trays.

QUICK MOUNT II

This unit offers the same features as the Quick Mount I with one exception. The ball socket adjuster has been replaced with a push button forward and reverse adjustment allowing the 22 inch extension arm to be rotated and locked every 22½ degrees.

Strobe Shopping Guide

STROBE	BATTERY SYSTEM	NUMBER OF FLASHES	CONNECTOR SYSTEM	RECYCLE TIME	DEGREE OF BEAM ANGLE*	F-STOP AT 3' ASA 64	APPROXIMATE RETAIL PRICE*
Ikelite Substrobe 75	ni-cad	300/40 ws 150/75 ws	Ikelite E-O	1.5/40 ws 3/150 ws	90	F-8	Ikelite: \$349.95 E-O: \$429.95
Ikelite Substrobe 150	ni-cad with replaceable module	600/40 ws 300/75 ws 150/150 ws	Ikelite E-O	1.5/40 ws 3/75 ws 6/150 ws	90	F-11	Ikelite: \$495 E-O: \$574.95
Oceanic 2001	ni-cad	360	E-O Nikonos II Nikonos III	6 seconds	94	F-11	\$550
Oceanic 2003	ni-cad	430/half power 280/full power	E-O Nikonos II Nikonos III	4/half power 6.5/full power	94	F-11, F-16	\$650
Sea & Sea YS-50	AA Batteries, ni-cad or alkaline	N.A.	Nikonos II Nikonos III SeaLoc	3 seconds	N.A.	F-8	\$350
Sea & Sea YS-150	ni-cad with replaceable module	360/75 ws 750/150 ws	Nikonos II Nikonos III SeaLoc	2/75 ws 3/150 ws	110	F-16	\$610
Subsea Mk100	300-volt battery	1500/50 ws 750/100 ws	Nikonos II Nikonos III E-O	3/50 ws 6/100 ws	90	F-8	\$449.60
Subsea Mk150	510-volt battery	1500/50 ws 750/100 ws 500/150 ws	Nikonos II Nikonos III E-O	2/50 ws 4/100 ws 6/150 ws	variable at two reflector settings	F-8, F-11	\$595
Subsea Mk225	ni-cad	300/75 ws 200/150 ws 100/225 ws	Nikonos II Nikonos III E-O	2/75 ws 4/150 ws 6.5/225 ws	110	F-11	\$899.95

*Manufacturer's published beam angle

appears to be the most even. This strobe is powered by a 510-volt battery and offers three power settings and a built-in slave mode. In addition, the new Mk150s have a user-replaceable modular circuit board and a replacement cord. Considering that most strobe failures will occur in either the circuit board or the sync cord, having these interchangeable in the field should prove advantageous. Note that a capacitor discharger *absolutely* should be used before attempting to replace the circuit board. If you get your wet fingers across some high-voltage DC, you'll definitely know it. The Mk150 and 225 have the largest exterior dimensions of any of the strobes tested, yet they are well balanced for underwater use. For wide-angle underwater photography, the quality of light generated by the Mk150 is still the standard by which all other strobes are judged.

The Mk225 is the only ni-cad strobe in the Subsea line and features a built-in slave and three power modes. The manufacturer suggests a flash expectation of 300 at 75 watt-seconds, 200 at 150-seconds and 100 and 225 watt-seconds. The beam is not as wide as the Mk150 since the reflector has been modified to accommodate the modeling light, but it is still a wide, even beam. It is, by a good margin, the most expensive unit tested.

The nine strobes reviewed here are by no means representative of every strobe on the market. Aqua-Craft, Sunpak, To-

shiba, Graflex and Sonic Research also sell quality strobes; Oceanic, Subsea and Sea and Sea have less expensive strobes in their product lines. These nine were chosen because they are all in the same general price range and fit the same market — high quality lights with professional features. There is no way to say which strobe is best. Before buying anything, the consumer should consider how much money he wants to spend, if a modeling light is necessary, how crucial is a difference in color temperature, if a built-in slave mode is critical, what is

the widest lens to be covered and whether the strobe should have ni-cads or disposable batteries.

Test Procedure

To make standard the evaluation of strobe performance, each unit was tested both underwater and topside exposures made in identical conditions. For the topside test each strobe was mounted on a tripod with the front of the dome port exactly three feet from the center of the grid. A 35mm camera equipped with a 20mm lens was tripod-mounted six feet from the center of the grid. Bracketed exposures were made so that identical-density negatives could be obtained for each strobe unit tested. Black and white prints were made from these negatives at an identical enlarger head height, exposure time, F-stop and development time.

For the underwater test the Nikkor 16mm lens in an Ikelite housing was the optical tool. By using a lens with a coverage of 180 degrees, the pattern of every strobe's light beam could be demonstrated by shooting at night. Rather than hold the strobe off at 45 degrees and above, as might be used in the ocean, the strobe was above the lens.

This provided a circular beam for the test rather than an elliptical beam and was easier to replicate. Model Janette Weeks held the exposure board and brackets were made over four stops. ☺

Buyer's Guide

Farallon/Oceanic
1333 Old County Road
Belmont, CA 94002

Ikelite Underwater System
3303 North Illinois Street
Indianapolis, IN 46208

Subsea Products
1006 West 15th Street
Riviera Beach, FL 33404

Sunshine Management Corp.
(Distributors for Sea and Sea)
439 Mola Avenue
Ft. Lauderdale, FL 33301



Ikelite 75



Ikelite 150



Oceanic 2003



Oceanic 2001



Sea and Sea YS50



Sea and Sea YS150



Subsea Mk100



Subsea Mk150



Subsea Mk225

Topside beam angle and evenness of illumination are illustrated in the nine tested strobes.

per charge. The literature claims 180 flashes per charge at 150 watt-seconds; not enough for a day of heavy shooting, particularly with the required 12 hour re-charge time. To achieve extended shooting capability a spare ni-cad power pack should be purchased as an option. Changing packs is simple and I'd like to see this feature in every ni-cad powered strobe. The YS150 has two power settings: 75 and 150-watt-seconds with a built-in slave. It is compact and handles well underwater. Both strobes are available with Nikonos II, III or SeaLoc connectors. Incidentally the SeaLoc does everything the EO can but costs less.

Subsea Mk100, Mk150 and Mk225

The Subsea line of strobes has been around a long time and its advertising claim, "The Choice of the Pros," is probably justified. With its glass-beaded reflector and warm color temperature, each unit generates a quality light beam. Unfortunately, the average consumer has had some problems in the past. In

the early days the strobes had a flat seal that was not dependable. A stepped poly seal was introduced later, and was then modified to reduce the possibility of a shallow-water flood. In late 1979, the company was bought by Graflex, a topside strobe manufacturer, and moved to the East Coast. This made service more accessible but West Coast customers had to contend with shipping times of up to a week each way. At the 1981 Diving Equipment Manufacturer's Association trade show, Subsea announced it would introduce service facilities on each coast which should expedite repairs.

The Mk100 is the smallest of the three Subsea units tested, and is the easiest to transport with carry-on baggage. It is powered by a 300-volt battery which the manufacturer claims will deliver 1500 flashes at 50 watt-seconds and 750 flashes at 100 watt-seconds. The strobe handles extremely well in the water and the support bracketry is adequate. The beam is even to the periphery and my experience with the strobe suggests it is a reliable unit. The major criticism of this strobe is that the 300-volt battery is difficult to obtain in some foreign coun-

tries and remote dive destinations. However, the high number of flashes per battery makes it worth traveling with one spare battery to be assured plenty of power.

This is the first of the strobes to be reviewed that has no ni-cad capability. In evaluating whether ni-cads or disposable batteries are best, the consumer needs to be aware of a few facts. For the person who shoots frequently the advantage of the ni-cad is obvious, a lower cost per flash. However, the person who only shoots once or twice a year should realize that a ni-cad needs to be used to maintain peak efficiency. In addition, recycle time with a ni-cad strobe is uniform until it will no longer fire, whereas the disposable battery generates longer recycle times as the battery exhausts. Therefore, the user has warning with a disposable battery. I've been surprised in mid-shoot with a ni-cad and had to swim to the surface to change strobes.

The Mk150 demonstrated the widest beam in both underwater and topside comparisons; the difference is most discernible underwater. The Mk150 is not as intense at the center of the beam as several of the other strobes tested, but it

Getting involved in underwater photography seems to fall into a pattern: first we dive, enticed by the excitement of an alien environment and the novelty of breathing underwater. Next comes dive travel, spearfishing or we collect shells. But there lies a subliminal desire to communicate as we see a special beauty; we seek the technique to convey this vision. But our initial efforts are shattered by poorly composed, out-of-focus bits of blue film.

So comes education. We learn that refraction of light may bias our estimation of distance, therefore we correct. We isolate a specific subject to improve composition. And we learn the full spectrum of sunlight we experience at the surface is selectively absorbed as a function of depth. Below 20 feet, reds and oranges do not record in available light, yellows are absorbed by 35 feet and below 65 feet, there is only blue and black. In an effort to restore color to the scene, we introduce artificial light, (see *Sport Diver*, Winter 1979, page 120).

A submersible strobe represents a substantial investment and each model offers significantly different features. To make the choice easier, we've compared nine high-quality submersible strobes. The black and white photos of the grid pattern demonstrate relative beam-angle and configuration, while the color photos illustrate underwater beam-angle, color temperature and intensity. Extraneous variables were controlled (see sidebar) so that observed differences could be attributed directly to strobe performance.

Ikelite Substrobe 75 and 150

The Ikelite strobe is a self-contained light source. Both models, Substrobe 75 and 150, offer a variety of features such as ni-cad power, built-in slave, built-in modeling light and multiple power settings. The primary difference between the two is peak power output and price, as each uses the same flash tube, reflector and body shell. The Substrobe 150 boasts a topside guide number of 60 with ASA 25 film, whereas the Substrobe 75 is rated at GN45. The 150 has an optional battery module and three-hour quick charger.

Either Ikelite strobe offers a number of features in a moderately priced unit. The modeling light is handy for those who dive and photograph at night. The strobe recycles quickly and offers a fair

number of flashes per charge at peak power. The beam is uniform in both the underwater and topside test, though the angle of coverage is not as broad as some other strobes.

The only two criticisms I have of the Ikelite strobes are the switch arrangement and the cost when equipped with an EO cord. Just beneath the ready light is a switch to engage the sync/slave mode. No problem there, but I found difficulty distinguishing between the nearly identical off/on/modeling light and the power selector switches. Working fast in low ambient light, I repeatedly turned the wrong switch. This confusion would certainly disappear with experience, but at first it's awkward. Also, I don't understand the \$80 extra per strobe to have the cord equipped with a male EO rather than an Ikelite connector. All my Nikonos cameras are equipped with female EO connectors and my housings have bulkhead EO connectors. No other manufacturer puts a premium on equipping their strobes with the male EO, why has Ikelite? Another minor difficulty with the Ikelite strobes is weight: they're the heaviest of any strobe tested in the water. However, Ikelite's engineers have trimmed six ounces from the topside weight and models marketed in the future will be more manageable. Overall, the Ikelite strobe is a quality light with a respectable number of features per dollar.

Oceanic 2001 and 2003

The Oceanic strobes tested are ni-cad units with a single external recharge port. Recharge time is only four hours and the manufacturer claims 360 flashes per charge for the 2001 model, and 280 to 430 for the 2003. Although these numbers are based on ideal conditions, the actual number of flashes per charge is excellent. The strobes are rugged and reliable. In addition, they are relatively small and handle well in the water. The support bracketry is well-conceived. In fact, the Oceanic pro-grip is probably the most comfortable Nikonos tray on the market.

Careful inspection of both topside and underwater beam patterns reveals a relatively narrow beam with considerable fall-off at the edges. The rated beam angle underwater is 94 degrees, but light at the edge of the beam is not the same intensity as light in the center. Older Oceanic strobes were criticized for being too "hot" in the center and to correct this the dome port was frosted. Now the beam is

more even but the light is more contrasty. In evaluating a strobe's performance the consumer should consider what is the widest lens to be covered. I've used both the 2001 and 2003 with a Nikonos 15mm and found the coverage adequate but I'm able to achieve more subtle lighting with a softer, wider light. In addition, the Oceanic's light was a bit more blue than others. On one hand, the Oceanic strobes offer a relatively narrow effective beam angle and slightly higher color temperature. On the other hand, they are very reliable, compact, recycle quickly, give many flashes per charge and have low cost per flash.

Sea and Sea YS50 and YS150

The black and white photos graphically demonstrate the problem with a rectangular reflector for underwater use on the YS50. The beam approximates the shape of the 35mm film format and this makes sense for use topside. Above water the strobe can be mounted directly to the camera so when turned vertically, the camera and strobe turn together and the beam shape and film shape remain coincident. Underwater, if the strobe is mounted directly via an arm to the Nikonos tray or housing the same principle applies. However, underwater the photographer should have the option of holding the strobe or using a mount. If the strobe is hand-held, it is a tremendous inconvenience to remember to hold it differently for verticals than for horizontals.

This is not meant as a blanket condemnation of the YS50. There are more considerations in a strobe purchase and for most people price is a prime factor. The YS50 is less expensive than other strobes tested, yet offers many features. There is a built-in slave, the unit is compact and can be powered by ni-cad or alkaline AA batteries. Another nice feature is the ability to place gelatin filters behind the diffusion grating and in front of the reflector. This permits use of a warm-up filter or colored gels for special effects. In general, the YS50 seems to be a good starter strobe if a lens no wider than 28mm will be used. Of course the built-in slave makes it adaptable to multiple strobe use as well.

Model YS150 is a well-conceived strobe and performed well in every aspect of the analysis. The beam is more than adequate to cover the Nikonos 15mm uniformly and color temperature is acceptable. Recycle time is quick, however this is at the expense of flashes

Stephen Frink is a regular contributor to Sport Diver.

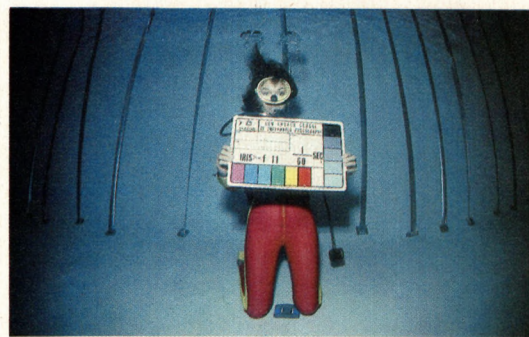
Underwater Photography: **Submersible Strobes:** **A Consumer Analysis**

It might be easier choosing a dive destination than an underwater strobe. Our hands-on comparison may make your choice a bit less difficult.

TEXT AND PHOTOGRAPHY BY STEPHEN FRINK



Ikelite 75



Ikelite 150



Oceanic 2003



Oceanic 2001



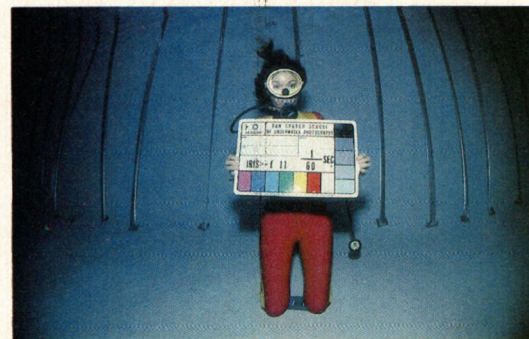
Sea and Sea YS150



Subsea Mk100



Subsea Mk150



Subsea Mk225

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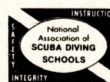
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